

April 27th Events

- Awards Convocation: 9:00 a.m., McNeill Concert Hall in West Campus
- Poster Session I & Lunch Reception, 11:30 a.m.-1:30 p.m., Multi-Sports Forum of the Bryan Campus Life Center
- Oral Presentation Sessions: 11:00-5:00 p.m., various locations
- Poster Session II & Closing Reception: 4:00-6:00 p.m., Multi-Sports Forum of the Bryan Campus Life Center

Acknowledgements and Special Thanks

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Oral Presentation Schedule by Division

Time	Room	Session Title	Departments/Programs
Social Science			
1:00-2:15 pm	Clough 302	Developmental Science and the Legacy of Martin Luther King: Advocating for the Civil Rights of Children I	Psychology
1:15-2:45 pm	Clough 204	Anthropology & Ethnography I	Anthropology & Sociology
1:30-3:00 pm	Buckman 200	Research in Political Science	Political Science
2:15-3:30 pm	Kennedy 205	Interdisciplinary Topics I	Psychology, History, Latin American & Latinx Studies, Anthropology & Sociology, and Computer Science
2:20-3:35 pm	Clough 302	Developmental Science and the Legacy of Martin Luther King: Advocating for the Civil Rights of Children II	Psychology
2:30-3:30 pm	Buckman 108	Empirical Economics I	Economics
3:00-4:15 pm	Clough 204	Anthropology & Ethnography II	Anthropology & Sociology
3:40-4:55 pm	Clough 302	Developmental Science and the Legacy of Martin Luther King: Advocating for the Civil Rights of Adolescents	Psychology
4:00-5:00 pm	Buckman 108	Empirical Economics II	Economics
4:00-5:00 pm	Clough 417	Interdisciplinary Topics II	Latin American & Latinx Studies, Anthropology & Sociology, Africana Studies, and Gender & Sexuality Studies
Humanities			
11:00 am – 12:30 pm	Buckman 200	Rhodes Historical Review	History
1:30-2:15 pm	Palmer 207	Cultural Encounters	History and Music
1:30-2:15 pm	Palmer 210	Asian Historical Studies	Modern Languages & Literatures
2:15-3:15 pm	Language Center	Spanish Senior Seminar I	Modern Languages & Literatures
2:30-3:15 pm	Palmer 210	Life of the Text	Greek & Roman Studies and Religious Studies
3:30-4:30 pm	Palmer 210	Regional Histories	History and Psychology
3:30-4:30 pm	Language Center	Spanish Senior Seminar II	Modern Languages & Literatures
Sciences			
1:30-2:00 pm	FJ-A	Quantitative and Computational Science I	Mathematics & Computer Science
1:30-2:15 pm	Robertson 110	The Natural World I	Chemistry
1:30-2:15 pm	FJ-D	The Natural World II	Biology
1:30-2:15 pm	FJ-C	The Physical World I	Physics
2:30-3:15 pm	FJ-A	Quantitative and Computational Science II	Mathematics & Computer Science
2:30-3:15 pm	Robertson 110	The Natural World III	Chemistry
2:30-3:15 pm	FJ-D	The Natural World IV	Mathematics & Computer Science
2:30-3:00 pm	FJ-C	The Physical World II	Physics
3:30-4:15 pm	FJ-A	Quantitative and Computational Science III	Mathematics & Computer Science
3:30-4:15 pm	Robertson 110	The Natural World V	Chemistry
3:30-4:00 pm	FJ-D	The Natural World VI	Biology and Mathematics & Computer Science
Fine Arts			
12:30-1:30 pm	Hassell 100	<i>Violet</i> : Gritty, Deconstructed Nostalgia in the Year of MLK50	Theatre
1:30-2:30 pm	Tuthill Performance Hall	The Cauthen Competition: Final Round	Music
2:00-3:00 pm	Clough 417	Studies of the Past and Present	Art & Art History
2:30-3:00 pm	Tuthill Performance Hall	Concert of NATS Student Competitors	Music
3:00-5:00 pm	Clough 312	FRESH: A Performance Art Showcase	Art & Art History
4:00-5:00 pm	Clough-Hanson Gallery	Studio Art Senior Thesis Exhibition: Enter Through the Window	Art & Art History

Oral Presentation Schedule by Building

Time	Room	Session Title
Buckman Hall		
11:00 am – 12:30 pm	Buckman 200	Rhodes Historical Review
1:30-3:00 pm	Buckman 200	Research in Political Science
2:30-3:30 pm	Buckman 108	Empirical Economics I
4:00-5:00 pm	Buckman 108	Empirical Economics II
Clough Hall		
1:00-2:15 pm	Clough 302	Developmental Science and the Legacy of Martin Luther King: Advocating for the Civil Rights of Children I
1:15-2:45 pm	Clough 204	Anthropology & Ethnography I
2:00-3:00 pm	Clough 417	Studies of the Past and Present
2:20-3:35 pm	Clough 302	Developmental Science and the Legacy of Martin Luther King: Advocating for the Civil Rights of Children II
3:00-4:15 pm	Clough 204	Anthropology & Ethnography II
3:00-5:00 pm	Clough 312	FRESH: A Performance Art Showcase
3:40-4:55 pm	Clough 302	Developmental Science and the Legacy of Martin Luther King: Advocating for the Civil Rights of Adolescents
4:00-5:00 pm	Clough 417	Interdisciplinary Topics II
4:00-5:00 pm	Clough-Hanson Gallery	Studio Art Senior Thesis Exhibition: Enter Through the Window
Frazier-Jelke		
1:30-2:00 pm	FJ-A	Quantitative and Computational Science I
1:30-2:15 pm	FJ-D	The Natural World II
1:30-2:15 pm	FJ-C	The Physical World I
2:30-3:15 pm	FJ-A	Quantitative and Computational Science II
2:30-3:15 pm	FJ-D	The Natural World IV
2:30-3:00 pm	FJ-C	The Physical World II
3:30-4:15 pm	FJ-A	Quantitative and Computational Science III
3:30-4:00 pm	FJ-D	The Natural World VI
Hassell Hall		
12:30-1:30 pm	Hassell 100	<i>Violet</i> : Gritty, Deconstructed Nostalgia in the Year of MLK50
1:30-2:30 pm	Tuthill Performance Hall	The Cauthen Competition: Final Round
2:30-3:00 pm	Tuthill Performance Hall	Concert of NATS Student Competitors
Kennedy Hall		
2:15-3:30 pm	Kennedy 205	Interdisciplinary Topics I
Palmer Hall		
1:30-2:15 pm	Palmer 207	Cultural Encounters
1:30-2:15 pm	Palmer 210	Asian Historical Studies
2:15-3:15 pm	Language Center	Spanish Senior Seminar I
2:30-3:15 pm	Palmer 210	Life of the Text
3:30-4:30 pm	Palmer 210	Regional Histories
3:30-4:30 pm	Language Center	Spanish Senior Seminar II
Robertson Hall		
1:30-2:15 pm	Robertson 110	The Natural World I
2:30-3:15 pm	Robertson 110	The Natural World III
3:30-4:15 pm	Robertson 110	The Natural World V

SOCIAL SCIENCE ORAL SESSIONS

Anthropology & Ethnography I

1:15-2:45 pm

Clough 204

Moderator: Eric Kemp

1:15-1:30 pm *Being "Inked": The Personal Meanings of Body Modification*

Amelia Tornatore

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

Tattoos and piercings may seem mundane or unnecessary to some, but to others they can mean something much more significant. This ethnography of Inked Memphis will be a look into the larger "body-mod" culture through the lens of a local shop; as well as a study of the studio's unique location and environment. Ethnography is the study of a specific culture or sub-culture through participant observation and expert interviews. I spent many hours at Inked Memphis watching, listening, and discussing tattoos and other body modifications (from both the artist/service side and from clientele of the shop), learning what body modification means to many and what these individuals are trying to tell us with their bodies.

1:30-1:45 pm *Memphis Zoo*

Tommy Dickelman

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

Throughout this semester, I've been making frequent visits to Memphis Zoo as a part of an ethnographic study. Memphis Zoo is located in Midtown, only a few blocks away from Rhodes, making it a location that directly effects the surrounding Memphis area. Zoo's across the country offer a look into the lives of animal's from around the world. They offer a wide range of appeal to the public, whether it be children at the petting zoo or students studying various unique species of animals. The goal of this ethnography is to discover the culture and attitude surrounding the Memphis Zoo through the use of the ethnographic method and how it connects the community in the rest of Memphis. The ethnographic method is a powerful tool when conducting research, allowing the researcher to dive in and absorb the culture they're surrounded by. I explore the groups of people found around the Zoo and connect with volunteers and workers through interviews, discussing their views and thoughts surrounding the Zoo. Needless to say, whether you're 6 or 60, the Memphis Zoo offers a fun experience for surrounding Memphis community.

1:45-2:00 pm *A Peace of Memphis: An Ethnography of Midtown Yoga*

Eric Kemp

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

When attempting to understand a different cultural scene, participant observation and its practices allow the ethnographer to engage actively and intimately with their field site. Therefore, participant observation diminishes any intrusive practices and rewards the ethnographer with detailed and significant data. In the heart of Memphis, Midtown is a busy area that never sleeps. I was fortunate enough to find a little corner of peace in Midtown Yoga. The ethnographic method and my role as an observer has rewarded me as I have immersed myself in the rich and historical practice of yoga. This study will not only be useful to myself as a young adult who struggles with arthritis and anxiety, but benefit fellow Memphians, looking for a healthy outlet, who may not be familiar with the cultural scene of yoga in their own backyard. Through this research, I have become more appreciative of the intimacy involved in the science of ethnographic methods and participant observation.

2:00-2:15 pm *Cupcakes with a Side of Coffee*

Madeline Smith

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

Ethnography is a form qualitative research where the objective is to provide an in-depth description of everyday life and practice. There is appreciation for the sensory stimuli of the sociocultural environment being observed. Ethnography generates an understanding of culture through representations as the “insider’s point of view” or participant observation for long term studies. As an anonymous drinker of coffee and sweet bakery item connoisseur, Muddy’s Bake Shop has been the environment of choice for my ethnographic work. There will be an emphasis on representation of patrons who use the coffee shop space while allowing for critical categories and meanings to emerge from the encounters rather than imposing existing models and theories on the observations. Observations have emerged with an appreciation for the following: space and sound, a combination of work and pleasure, how space and time influences the environment of the coffee shop, and how cupcakes can affect the traditional coffee shop atmosphere. In this ethnographic research there were will be an exploration of how the combination of a traditional coffee shop with the nontraditional daily treat of cupcakes can affect the way we interact with work, literature, music, and friends within the structure of a bake shop.

2:15-2:30 pm *4-String, 6-String, Red Amp, Blue Bass: My Experiences at Martin Music*

Kiefer Gorena

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

Next to the piano/keyboard, the guitar is the most commonly played musical instrument, nearly omnipresent in all popular music. I play it myself, and I bet at least a couple of people reading this abstract do too! But for all the attention given to the guitar itself, there is a comparative lack of it given to the stores which sell them and the cultures therein. I focused on one such store,

Martin Music, located on Poplar Street in Memphis, Tennessee. For four months, I spent an hour and a half a week there, over time acquainting myself with the many employees, patrons, amps, pedals, ukuleles, and, of course, guitars, quite well. I learned that the people there express an inordinate amount of passion for music, inviting anyone to come in, talk and play, let alone buy anything. Through participant research and numerous conversations, my ethnography, a report on my experiences, draws upon my conversations and interviews regarding music and guitars as hobby, art, and lifestyle with customers and employees alike.

2:30-2:45 pm *Conceptualizing the Bicycle as a Vehicle for Education and Social Change: An Ethnography of Revolutions Bicycle Cooperative*

Bridget Blair

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

Revolutions Bicycle Cooperative, located in the basement of First Congregational Church in Memphis, Tennessee, is a communal workshop space utilizing the bicycle as a tool for education, community engagement, and social change. For three months, I conducted an ethnographic study within Revolutions in an effort to better understand how a communal space structured around the bicycle informs the social interactions of its members. The ethnographic method employs participant observation and informal interviews as a means to understanding and attentively documenting a cultural scene. While positioned as a member of the cooperative, I was able to improve my technical cycling and bicycle maintenance abilities, but I was also able to observe the ways in which the cooperative offered a space for community conversation, encouraging the development of both physical and social awareness of the self within society. The ethnographic method provided an immersive approach to understanding the cultural scene at Revolutions Bicycle Cooperative, emphasizing the potential power of ethnography to both document and invite cross-cultural experiences.

Anthropology & Ethnography II

3:00-4:15 pm

Clough 204

Moderator: Merit Pinker

3:00-3:15 pm *The Wind Beneath My Chicken Wing: An Ethnographic Study of Bosses*

Arati Joshi

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

Ethnography is an integral part of anthropological research. It provides researchers a tool to act as both an observer and a participant in a cultural scene. This semester, I have been conducting an ethnographic study of the chicken wing restaurant, Bosses, located in East Memphis. In order to understand how Bosses contributes to Memphis culture and creates its own community, I immersed myself within the restaurant through participant observation and tried to remain open-minded and not come in with preconceived notions. I am exploring the interactions between the

employees and customers, the demographics of those who are customers, the importance of creating cultural and community bonds over breaking bread, and what being part of this cultural scene truly means. From the outside, Bosses seems like a generic restaurant, but once inside, a dynamic cultural scene is tangible and is worth participating in and studying.

3:15-3:30 pm *A Pocketful of Filipinos - Inside VGM Foods & Deli: Taste of the Pacific*
Dariane Pedines

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

Ang hindi lumigon sa pinanggalingan, hindi makakarating sa paroroonan is a very popular Filipino proverb, in English this translates into “A person who does not remember where he came from will never reach his destination.” With ethnography, anthropologists and sociologists are able to study people from different cultures through immersion and observation known as participant observation. My ethnographic research focuses on my participant observation at VGM Foods & Deli: Taste of the Pacific. Every person who walks into VGM is welcome. The unique space is homey; everyone is treated like family. At this site people are able to shop for groceries, dine in, or order food to go at all their convenience being that this space doubles as convenience store and deli. VGM Foods & Deli was established to serve the purpose of keeping the ethnic roots close to the heart even far from home. Their message to the Memphis community is to remember where you came from and remember who you are. This site is a microcosm of not only Filipino, but Asian, culture in the south. Having the privilege of observing this business helped me understand the ins and outs of Filipino interaction, community and culture in Memphis, Tennessee.

3:30-3:45 pm *Oh Kale Yeah: An Ethnographic Study of Two Vegan Sistas*
Merit Pinker

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

People choose to lead a vegan lifestyle for a variety of reasons, but no matter the reason, from health to philosophy, having a restaurant that can serve those who choose such a lifestyle is important. This semester, I have been conducting ethnographic research, using participant observation, at one of the few completely vegan restaurants in the Memphis area, Two Vegan Sistas. I have been using this method to learn about the community created amongst those choosing to live a vegan lifestyle. I have positioned myself as a customer of the restaurant, giving myself a vantage point from which to observe the way customers and employees interact with each other, as well as the space. Two Vegan Sistas aims to create a space where both vegans and non-vegans can enjoy delicious, healthy food in a comfortable, intimate space. The uncommon flavors and bright orange walls create a stimulating environment that continuously engages the senses. I will be exploring the themes of the power of food to create commonality amongst strangers, and the critical role that space plays in creating community. This ethnography will show how a culture centered around vegan food creates an inviting space and brings people together.

3:45-4:00 pm *Cymbal-ism*

Josh Lucas

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

Drums can be made of anything from a plastic bucket to a stretched cowhide. They exist across nearly all cultures and have been around for hundreds of thousands of years. To many different peoples, they represent different things, and this research has given me a unique opportunity to experience some of those things. Memphis Drum Shop's worldwide shipping, diverse inventory, and history of working with world-renowned drummers have made it the center of the drumming culture. Conducting an ethnography of the shop has given me an opportunity to experience the unique culture of shops around the world through the lens of this specific shop itself. The main intent of my research has been to appreciate and better understand the ethnographic method, and an observational study has helped me do that.

4:00-4:15 pm *A Closer Look at Shangri-La Records*

Grace Cloar

Faculty Sponsor: Susan Kus, Department of Anthropology & Sociology

Shangri-La Records is a place where the senses are always engaged. Whether you're getting lost in the music that is playing throughout the store, flipping through the many different genres of vinyl, or simply looking around at the eclectic assortment of art, posters, and signs that cover every inch of the store. Shangri-La is a local record store located in Midtown, Memphis, and I have learned that they do much more than just sell records. Throughout the semester, I have been conducting an ethnographic study of Shangri-La in order to gain a more holistic perspective of the site. The ethnographic method has allowed for me to immerse myself in the cultural scene of the store through participant observation. I have questioned my assumptions, stepped outside of my comfort zone, and developed an appreciation for the unexpected. I hope to learn more about who interacts with the space, how, and why. Especially in the digital age of streaming music.

Interdisciplinary Topics I

2:15-3:30 pm

Kennedy 205

Moderator: Keyshawn Butts

2:15-2:30 pm *Social Class and Occupation Associations Moderated by Race*

Katrina Cymerman

Faculty Sponsor: Matthew Weeks, Department of Psychology

Previous research found support for the notion that people associate occupations with specific social classes. This study is specifically looking into the combination of race and gender and their effects on participants' social class associations. Our previous study found that participants systematically associated black males with lower SES occupations than the white male targets, even when the targets are described in the same way. In our study, we provided participants with

one randomly assigned picture of a white female or black female target in order to see if the effect extends to female targets. Under the picture, we placed the target's name and a specific social class rank ("working class" or "middle class"). After presenting participants with this information, participants chose plausible occupations for the target from a list of provided jobs. After choosing six occupations, the participant was asked to rate each job on its prestige. The aim of this study was to assess whether participants would systematically assign occupations associated with a lower SES to black female targets rather than white female targets.

2:30-2:45 pm *Fantastic Beasts: A Look into Medieval Geographical Stereotypes Depicted in the Bestiary, MS Bodley 764*

Katie Cynkar

Faculty Sponsor: Hannah Barker, Department of History

MS Bodley 764 is a British bestiary that dates from approximately 1220 to 1250. A bestiary is similar to an encyclopedia of animals of which examines the physiology, habitat, and behaviors of animals while also drawing allegorical lessons intended to guide the spiritual and moral behavior of humans through the use of text and illustration. Each animal has a spiritually symbolic interpretation attached to it of which can be good, bad or a warning against sinful behavior. Of all the animals in Bodley 764, 39 animals have locations associated with them. These locations consist of places in Africa including Ethiopia, Egypt and rivers in Egypt, places in Asia including India and Arabia, and places in Europe such as Germany and Ireland. While each individual animal has its own symbolic meaning, each area consists of a group of animals with similar moral symbolism. These symbolic interpretations follow similar didactic guidelines as the medieval map, the mappa mundi, suggesting that there is relative similarity between the animals and geography. This presentation will answer whether or not the descriptions of animals in MS Bodley 764 are similar to perceptions about people in specific geographical locations.

2:45-3:00 pm *"El Que No Tiene Trabajo No Tiene Derecho a Nada, Solo a la Muerte"*

Daniela Garcia

Faculty Sponsor: Elizabeth Pettinaroli, Department of Modern Languages and Literatures

As a study of the intersecting Global South and the American South, this project seeks to explain why neoliberal economic policies have influenced migration patterns and motivated undocumented day labor practices in Memphis, Tennessee. A history of Mexican labor in the United States since the beginning of 20th century serves as a framework for linking the praxis of migration to global economics. Colonial expansion, industrialization, wartime mobilization, and neo-liberalization suggest that a recurring pattern of importation, extraction, and deportation has reified a structure of a disposable workforce in the United States. This NAFTA in the Delta narrative explores the nuances of rapid economic change in Mexico producing the displacement of workers to booming manufacturing towns at the border and eventually across national boundaries into the United States. Economic reinvigoration and the promise of financial prosperity in the American South generated an explosive Latin American population growth

throughout the 1990's into the 2010's. This research connects macroeconomics to an ethnographic study of the day labor population in one of Memphis' Latinx neighborhoods. Motivated by experiences of immigrating to Memphis as a child in the early 2000's and witnessing the bodily degradation of low-wage labor this project was inspired by familial generations of railroad workers, corn farmers, and manufacturers.

3:00-3:15 pm *Indigenismo, Indianismo, and Incaismo in Peru: Negotiating narratives of identity and class in a neoliberal hegemony*

Merare Sanchez

Faculty Sponsor: Elizabeth Pettinaroli, Department of Modern Languages and Literatures

A survey of contemporary Peruvian life reveals the failures of the nation-state model in its attempt to assimilate the indigenous worlds and peoples into the project of Modernity. Through the political ideologies and discourses of Indigenismo, Incaismo, and Indianismo, intellectuals and politicians negotiated the place of pre-Hispanic collectivities and their descendants within imposed Western models, attempting to claim a space for indigenous groups within the body politic. Under Neoliberal narratives of progress, formal education was identified as the solution for poverty and inequality. Nevertheless, economic inequality and discrimination persist and are often masked within the academic realm. This study explores Indigenismo and Incaismo as political projects that have contributed to the reification of hierarchical and exploitative practices supporting the artifice of Modern nation-states. These failed Western models are contested by more recent political movements spearheaded by Indianismo, under its banner of resistance. The very existence of these contestatory spaces reveals the incomplete nature of the project of Modernity.

3:15-3:30 pm *Grade A: A Perspective on Grade Management*

Keyshawn Butts

Faculty Sponsor: Betsy Sanders, Department of Mathematics & Computer Science

This paper presents a proposal for a mobile platform to revolutionize how students manage their grades. The mobile iOS application, Grade A, will help students set and achieve goals for their semester. In the application, students will specify a certain target grade for their class and Grade A will show what you the grade you need to achieve for each assignment. This will allow students to know where they stand in accomplishing their academic agenda. Through this mathematical algorithm, Grade A will eliminate the stress and suspense over what grade they need to make on their assignments. It allows students to stay ahead of their class by having a better idea of how they need to perform. This paper presents the need for such an application and the outlines the theory and methodology in implementing Grade A.

Interdisciplinary Topics II

4:00-5:00 pm

Clough 417

Moderator: Jessica Cabrera

4:00-4:15 pm *Dual Consciousness and the Weaponization of Racialization*

Jessica Cabrera

Faculty Sponsor: Noelle Chaddock, Associate Dean of Academic Affairs

Racialization of human bodies and lives generalize cultural communities through processes of both a self-actualization of a race consciousness, which challenges spaces to belong to cultural groups based on a racial hierarchy adopted by the United States. Within the United States, contradictory ideologies on race relations polarize the rhetoric and practice of racial identity politics. On one side, the United States mythologizes a narrative of a melting pot for diversity and immigration to sustain culture under fixed ideologies of nationalism and capitalist gain. On the other side, social hierarchies stratify communities to perpetuate the social hegemonic narrative of social order and free labor with little mobility or prospects. Conversations around racial conflict in the United States center around oppositional forces of Whiteness and Blackness, which further legitimatizes systems of power based on racial ideologies. A focus on the displacement of Mexicans and Mexican Americans, like myself, confront the use of racialization to disenfranchised populations, because theses identities harbor a dual consciousness in their personhood. Through examination of racial stratification in establishing Mexican American culture and auto-ethnographic methodology, I grapple with the weaponization of racial ideology as it pertains to Mexican Americans in the United States.

4:15-4:30 pm *Geopolitics and the Relational Nature of Home: Considering Diasporic Identity and Displacement in Memphis* ■

Jennifer Bitterly

Faculty Sponsor: Noelle Chaddock, Associate Dean of Academic Affairs

The challenges of migration and acquisition of legal status in the US are numerous, persistent, and rapidly expanding. Geopolitically-motivated distinctions between the categories of “migrant”, “immigrant,” “refugee,” and “asylum-seeker” all result in pronounced disparities in the quality of life experienced once someone has migrated. Compounded with this current political climate and increasingly frequent ICE raids, for-profit detention centers, the current DACA situation, and delayed visa processing times, diasporic communities in the United States, particularly those from Latinx backgrounds, face severe challenges. This presentation will be centered around an ethnographic study of immigrant and refugee experiences in Memphis, Tennessee, though it also investigates larger patterns across diasporic communities in the mid-south. Drawing upon interactions with law firms and immigration attorneys, the presentation will examine the ways in which geopolitics have motivated immigration laws to then focus on how these categorical distinctions shape social realities at an intimate level, particularly regarding

experiences of home. In the absence of a fixed physical place, “home” becomes a highly imaginative and relational understanding of security and belonging. Incorporating mixed methodologies of ethnography, auto-ethnography, and quantitative data, I will intentionally explore the negotiations between diasporic identities, experiences of home, and larger political entities surrounding immigration status.

4:30-4:45 pm *Race, Nation, and Place*

Caroline Reilly

Faculty Sponsor: Noelle Chaddock, Associate Dean of Academic Affairs

This research aims to establish a theoretical foundation through which we might begin to understand and problematize the intimate relationship between racial identity and cultural context in the lives of racially ambiguous people. In combining the historical narratives of Irish-identified people’s experiences in the Americas with current research on mixed race identity, a pattern of (re)designation emerges in the lives of those whose social identities are more conceptually fluid. During the colonial history in the Americas, Irish-identified people experienced cultural and socioeconomic shifts that regularly designated them to both oppressive and privileged positions in a given context, and they sometimes occupied these spaces simultaneously. This pattern of (re)designation happened as African slavery became more central to the colonial economy, and as a need for Europeanness and whiteness to prevail in space that was becoming increasingly nonwhite arose. (Re)designation serves as a point of convergence and divergence in the narratives of racially ambiguous individuals. In exploring the ways in which racially ambiguous people negotiated their identities historically in varying contexts will shed light on both the fluid nature of racial ambiguity and the privileges whiteness incurs.

4:45-5:00 pm *Pain Silencing and Sexism: The Interaction of Gender and Racial Identity and the Treatment of Pain in Clinical Environments*

Chloe Burkhead

Faculty Sponsor: Noelle Chaddock, Associate Dean of Academic Affairs

The purpose of this study was to a) explore how the clinical communities diagnose/treat female pain and to b) understand how race and class mediate this experience. Most importantly, this study examined how women-identified individuals understand their own pain within the parameters of their clinical experiences. Participants were interviewed with two or three other women-identified family members and/or close friends. The interview consisted of questions about how the participants perceived and conceptualized their pain experiences; additionally, the interview was designed so that the participants could reflect and expand upon each other’s experiences. Using qualitative analysis methods, this study aimed to inform future, larger-scale studies on female pain perception and reception in clinical environments. Findings indicated that participant perception of pain may differ based on their racial, gender, and class identities.

Empirical Economics I

2:30-3:30 pm

Buckman 108

Moderator: Erin Kaplan, Department of Economics

2:30-2:45 pm *Do Insurance Premium Surcharges for Tobacco Use Encourage Smoking Cessation?*

Christian Allen

Faculty Sponsor: Erin Kaplan, Department of Economics

As of 2014, the Affordable Care Act allows marketplace plans to impose a surcharge of up to 50% on tobacco users' insurance premiums. The surcharge is intended to account for tobacco users' excess health care costs and encourage smoking cessation. Using data from the 2011 and 2015 Current Population Survey, we use rates of smoking cessation before and after implementation of the Affordable Care Act to estimate the impact of the tobacco surcharge.

2:45-3:00 pm *The Impact of Competition from Charter Schools on Student Achievement*

Katherine Gabrick

Faculty Sponsor: Erin Kaplan, Department of Economics

Much of the economic literature on the impact of charter schools describes the effect of attending a charter school on student achievement scores. Fewer studies have tried to measure the impact of charter schools on traditional public schools within the same district. Using a fixed effects model, we will measure how competition between charter schools and traditional public schools within the same urban district affects the achievement scores of students attending traditional public schools as well as the achievement scores of the entire district.

3:00-3:15 pm *Alumni Annual Giving Determinants at an Urban Liberal Arts College*

Jesse Linkhorn

Faculty Sponsor: Erin Kaplan, Department of Economics

Alumni donations serve as an integral funding stream for colleges and universities and often fill the gap between the poor and healthy fiscal status of smaller institutions. Analyzing a variety of qualitative donor variables allows college administrators to effectively target key alumni to maximize donations. This paper uses 27 years of Rhodes College alumni data and a fixed effects model to identify potential determinants of donation frequency and magnitude by controlling for individual level characteristics while a Rhodes student (athletics, music/arts, Greek life, volunteering, scholarship recipient, etc.) and while a Rhodes alum (major reunion years, donor rating, current residence, time of donation solicitation, etc.). I hypothesize that frequent donors give significantly higher amounts on average during their major reunion year than infrequent donors. Additionally, I expect donor characteristics such as Greek life affiliation, time of solicitation, and residence in a charter city to be significant determinants in frequency and magnitude of donations.

3:15-3:30 pm *Boston's Late-Night Subways and Buses and Their Effect on Drunk Driving*

Jack Patton

Faculty Sponsor: Erin Kaplan, Department of Economics

The city of Boston started its “Late-Night Service Pilot Program” on March 28th, 2014. The program extended the hours of all of Boston’s subway lines and 15 of its bus routes from 1am to 3am on Saturday and Sunday mornings. Citing high costs, the city of Boston ended the program on March 20th, 2016. My project will examine the impact of the program on automotive fatalities involving alcohol. I hypothesize that public transportation will lower the cost of alternatives to driving while intoxicated, leading to a decrease in drunk driving, and alcohol related fatalities.

Empirical Economics II

4:00-5:00 pm

Buckman 108

Moderator: Jaqueline Oliveira, Department of Economics

4:00-4:15 pm *Understanding the Relationship of Youth Opportunity on the Strength of Regional Terror Groups*

Nick Hallmark

Faculty Sponsor: Jaqueline Oliveira, Department of Economics

Understanding the underlying causes of terrorist activity and what allows terror groups to gain recruits and influence is essential in the fight against violent extremism. Studies into what factors increase the likelihood of terror activity exist, however, little has been done to provide an empirical look at what leads to increased terror group power within a region. In analyzing previous literature into the effects of youth opportunity on crime as well as large youth populations on political extremism I present a theoretical framework for why low youth opportunity may lead to increased extremist activity. I answer this question of how youth opportunity effects extremism by using a rich panel data set of all terror incidents since 1991 as well as indicators of youth opportunity such as unemployment, expected education, fertility, internet access and political rights. This study finds that there is evidence to suggest that decreased economic opportunity for young adults has a significant impact on the relative strength of terrorist groups. I also find that this effect is more greatly pronounced for males and has a more significant impact in low income countries.

4:15-4:30 pm *A Hedonic Study of Overton Park*

Helen Hope

Faculty Sponsor: Erin Kaplan, Department of Economics

As urbanization increases, city parks are becoming more susceptible to development without proper market evaluation of the public assets. This study will estimate a hedonic house price model to estimate the value of Overton Park in Memphis, Tennessee. In addition to property

characteristics such as bedrooms, bathrooms, age, and condition, I control for neighborhood walkability and school quality. I expect that, holding other home and neighborhood characteristics constant, houses in closer proximity to Overton Park will have higher sales prices, reflecting household preferences for amenities located in Overton Park.

4:30-4:45 pm *Exogenous Shocks to Family Size and Probability of Divorce*

Zoe Laulederkind

Faculty Sponsor: Jaqueline Oliveira, Department of Economics

This paper investigates the association between fertility and marital instability. By studying number of children in the context of an exogenous shock to family size, such as first-born twins, I identify negative bias resulting from the correlation between number of children and unobserved family planning in predicting divorce. I find evidence that controlling for demographic variables and then instrumenting number of children with instances of first-born twins reveals number of children to be statistically insignificant in predicting divorce as opposed to other related findings. To further investigate the nature of the exogenous shock, I analyze the effect of the sex of first-born twin pairs in the context of an instrument for sex of the first-born child in predicting probability of divorce. The findings suggest a negative bias resulting from female first-born twins being counted as one single female first-born child. My research suggests children might not play as large a role in keeping their parents together as the common American phrase “staying together for the kids” implies.

4:45-5:00 pm *Estimating the Impact of Poverty on the Development of Mental Illness*

Ashley Peterson

Faculty Sponsor: Jaqueline Oliveira, Department of Economics

Studies on the SES-mental health relationship have shown a negative causal relationship and have begun to investigate the causal mechanisms. I intend to add to this existing body of research by evaluating the impact of psychoeconomic factors (associated with poverty and economic hardship) on the development of mental health disorders. My findings indicate that there is a robust causal connection between low socio-economic status and anxiety and depression.

Research in Political Science

1:30-3:00 pm

Buckman 200

Moderator: Ried Roshong

1:30-1:45 pm *Confronting the Court: The Supreme Court, the Confrontation Clause, and the Ways They Interact*

Daniel Elliott

Faculty Sponsor: Renée Johnson, Department of Political Science

The Confrontation Clause, a collection of eighteen words contained within the Sixth Amendment, protects the right of the criminally accused to “be confronted with the witnesses against” him or her. Yet, as decades of Supreme Court litigation have sought to redefine this right, the meaning of the Confrontation Clause has changed noticeably. This paper seeks to determine what reasons may underlie the Supreme Court’s decisions in Confrontation Clause litigation. By examining data collected from Supreme Court cases between 1953 and 1997 that deal with Confrontation, this paper uncovers the ideological tone of the lower court’s opinion as one possible predictor of judicial decision-making of the Supreme Court.

1:45-2:00 pm *A Measured Approach to the Death Penalty*

Connor Hurley

Faculty Sponsor: Anna Eldridge, Department of Political Science

Capital punishment is a fixture of the American justice system. To the disdain of many, the death penalty has endured despite numerous problems. While a number of objections to capital punishment are deeply rooted in religious, moral, and philosophical beliefs, major issues can be found in its implementation and basic procedure as well. My paper discusses the history of capital punishment in the United States, with a focus on the movements to abolish or alter the death penalty, as well as proposes solutions to several important legal and procedural issues. In order to deal with problems such as racial bias, wrongful conviction, and proportionality of the crime to the punishment, several additional safeguards must be put into place throughout the litigation process. The basis of this study will reflect the ongoing struggle to reconcile the constitutional rights of the accused with society’s desire to promote a safe community.

2:00-2:15 pm *Terror, Tolerance, and Trump*

Victoria Holder

Faculty Sponsor: Renée Johnson, Department of Political Science

A Pew poll found that the majority of Americans see the Democratic Party as more open and tolerant and find the GOP to be generally lacking in both tolerance and empathy (Pew Research Center 2015). Both parties demonstrate politically reactive behavior to the influence of fear but the common belief is that conservatives inherently take a more nationalistic and isolationist stance in their responses. Following the widely unpredicted result of the 2016 presidential campaign of Republican candidate Donald Trump, political pundits speculated that his promises of reduced immigration and strong military response in the wake of terror attacks overseas caused a strong conservative voter turnout (Walsh 2016). Through analyzing the different responses of conservative and liberal voters to fear and terror-related questions in the American National Election Studies’ 2016 Time Series Study, my research explored the question, “Did Trump supporters experience higher levels of fear?”

2:15-2:30 pm *The Modern Crusade: Understanding Christian Views of Homosexual Marriage*

Ried Roshong

Faculty Sponsor: Renée Johnson, Department of Political Science

In this research project, I set out to investigate the foundation of Christian views concerning homosexual marriage. I analyzed survey data from the 2016 election cycle and sermon contents from two different Baptist churches generated over the past eight years to further my understanding of how Christians across America respond to the notion of homosexual marriage. I hypothesized that the Christian anti-gay movement in America is not holistically motivated by Biblical interpretation, but is also motivated by the morally-traditional views of ideologically-conservative Christians. During my research, I found that Christians in survey sample do not have unified views of homosexual marriage. Instead, I found that only certain Christian groups – especially such denominations as Evangelicals and Baptists – were negatively correlated with a approval of homosexual marriage to a statistically-significant degree. Furthermore, after conducting my analyses, I found 1) that there are statistically-significant correlations between multiple independent variables which indicate ideological bias and opinions concerning homosexual marriage and 2) that there is strong evidence to suggest that those independent variables also affect individuals’ actual Biblical interpretations, meaning Biblical interpretation would act as an intervening variable between Ideological Bias and Opinions Concerning Homosexual Marriage.

2:30-2:45 pm *Does Religious Affiliation Affect the Likelihood That an Individual Will Support State Policies That Address Climate Change*

Alexia Spanos

Faculty Sponsor: Renée Johnson, Department of Political Science

My research question revolves around how religious affiliation affects the likelihood that an individual will support state policies addressing environmental concerns. As of late, President Trump has retracted the United States from the Paris Agreement, which works towards mitigating climate change. Because of this, states have stepped forward to uphold the agreement, making them a more prominent actor when it comes to environmental policy. Additionally, past research has shown that religion may be an important indicator of whether or not an individual supports certain environmental policies. For my research, religious affiliation was the independent variable and support for environmental policies under the Clean Power Plan was the dependent variable. The data used in my research was collected from the National Surveys on Energy and Environment of 2015. In my model, I also included variables such as income, gender, education, age, region, political ideology, and party affiliation. After running linear regressions, I found that religion was not a statistically significant factor in predicting support for environmental policies. Political ideology and party affiliation were both statistically significant, however, when those variables were not accounted for both age and gender became statistically significant.

2:45-3:00 pm *Supreme Court Legitimacy: What variables influence the public's trust in the Court?*

Sarah Ryan

Faculty Sponsor: Renée Johnson, Department of Political Science

The highly politicized confirmation of Justice Neil Gorsuch to the Supreme Court made the question of Supreme Court legitimacy resurface as one of public interest. Court legitimacy explains how the public understands and trusts that the Court's rulings are based on and justified by the law of the land. The purpose of this study is to explore what factors are related to or might influence the public's trust in the Supreme Court. This analysis uses data from Wave One of the 2005 'Citizen, Involvement, Democracy' Survey to run frequency distributions, cross-tabulations, and linear regressions that test the relationships between and effects of several factors on the variable 'Trust in the Court.' Careful analysis revealed that the variables 'Race,' 'Ideology,' and 'Opinion of Politics in the Court' have a statistically significant effect on the value of the dependent variable. This analysis has made good progress in understanding what factors might influence the public's trust in the U.S. Supreme Court, and also interestingly challenges many of the variables that other studies have found to be significant. Such studies display the continuing importance of the public's relationship with the Court and perception of it as a legitimate institution.

Developmental Science and the Legacy of Martin Luther King: Advocating for the Civil Rights of Children I

1:00-2:15 pm

Clough 302

Moderator: Marsha Walton, Department of Psychology

Throughout this semester, the city of Memphis has been commemorating the 50th Anniversary of the assassination of Dr. Martin Luther King, evaluating the progress we have made toward a more just society and asking where we fall short of the vision Dr. King articulated. Among the many cascading influences of Dr. King's work has been a movement for children's rights, a movement that culminated in the 1990 adoption by the United Nations of a set of 41 articles agreed upon by all the member nations, excepting the United States and Somalia, articulating a set of rights that ought to be afforded all children and youth. We have used this semester to consider the United Nations Convention on the Rights of the Child (UNCRC), and to address questions about how theory and research on child development might inform our efforts to realize the vision of a just society described by Martin Luther King. Each of four learning teams has selected one aspect of the UNCRC and will 1) describe where we fall short of compliance with the specific articles of the charter under consideration, (2) present relevant empirical evidence in developmental science, and (3) describe programs or contexts which have been shown to accomplish the aims of those UNCRC articles.

1:00-1:05 pm *Welcome and Introduction to the Session*

Jessica Cabrera and Laura McDowell

1:05-1:15 pm *Corporal Punishment as a Violation of Children's Rights to Protection from Violence*

Jessica Cabrera, Elly Brooks, and Madison Treas

Faculty Sponsor: Marsha Walton, Department of Psychology

In the wake of the 50th anniversary of Dr. Martin Luther King's assassination, we consider how his message of non-violence relates to the civil rights of children. Article 19 of the UNCRC specifies that children should be protected against violence when in the care of parents or teachers, and Article 2 specifies that this protection be provided to children without discrimination based on race. We will present evidence that the United States fails to secure children's rights in both of these cases. The rate of corporal punishment in schools is decreasing due to states enacting laws against it, however it is still practiced in 19 states, and research shows that it is used in a discriminatory way against children of color. We will present research evidence for the negative outcomes of corporal punishment on children's social, emotional, and cognitive development. We will end our presentation by describing alternate disciplinary techniques that will not negatively impact children's ability to grow and develop.

1:15-1:25 pm *The Violation of Children's Right to Clean Water in Flint, MI*

Sophia Baggett, Madeline Estes, and Zoë Feder

Faculty Sponsor: Marsha Walton, Department of Psychology

Our presentation is on Article 24 of the UNCRC, which states every child has the right "to the enjoyment of the highest attainable standard of health" and, as part (c) elaborates, State Parties shall make every effort to "combat disease and malnutrition, including within the framework of primary health care, through, inter alia, the application of readily available technology and through the provision of adequate nutritious foods and clean drinking water, taking into consideration the dangers and risks of environmental pollution." The water crisis in Flint, Michigan is a primary case study of how our government is in violation of this article. Government officials have been blamed for switching Flint's water supply to a highly contaminated source without proper implementation of a filtration system, which resulted in high levels of lead, iron, and other contaminants that made tap water unusable for drinking, bathing, or cleaning. We will present research about how nursing mothers and children are disproportionately affected by unclean water, as lead poisoning water contamination has many adverse, long term, mental and physical health effects including infant mortality. We will present two studies that look at water sanitation in US, one focusing on the area affected by Hurricane Katrina and the other Flint, that have caused disease and other adverse effects in young, developing children and mothers. It is the responsibility of the government to protect them properly and we urge our government to instate water filtration and purification in Flint as soon as possible.

1:25-1:35 pm *The Promise of Media for Securing Martin Luther King’s Dream of Multicultural Understanding*

Lauren Hakim, Emily Pierce, and Mary Gunning

Faculty Sponsor: Marsha Walton, Department of Psychology

Article 17 of the UNCRC asserts that every child should have access to media without discrimination, especially media that pertains to the promotion of his or her well-being and physical and mental health. In addition to this, we believe that every child has a right to multicultural media that grounds them in their own diverse cultural backgrounds as well as enabling them to gain a greater understanding of the backgrounds of others. Historically, there has been a lack of culturally relevant media for minority populations within the United States. This lack of multicultural media is still seen today, as evidenced by the public outcry for greater diversity and inclusivity in TV, film, and literature, including the controversy surrounding the all-White nominees of the 2016 Academy Awards. First, we will provide statistical evidence that demonstrates the exclusion of multicultural backgrounds and experiences in the media. Then, we will discuss several studies that demonstrate the benefits of providing multicultural media to all children, as it encourages cultural understanding and social sensitivity. Finally, we will end with recommendations for developing positive multicultural media that is accurate and authentic in order to correct for the discriminatory allocation of these resources.

1:35-1:45 pm *Children’s Rights to Culturally Responsive Education*

Alyssa Owens and Alexis Franklin

Faculty Sponsor: Marsha Walton, Department of Psychology

Article 30 of the UNCRC asserts that ethnic, religious, linguistic minorities and persons of indigenous origins have the right to enjoy, practice and use aspects of their culture. Our research has found that cultural inclusivity is lacking in United States Public School systems. Educational curriculum in our schools is influenced by European centered cultural ideas even though in the near future ethnic minority groups such as African Americans and Latinx will be the majority of the population. We will review evidence that public education is failing to reach culturally and linguistically diverse student populations, particularly those with and at risk for disabilities, resulting in disproportionate academic underachievement, special education referrals, and disciplinary actions. This may be due to the fact that public schools do not include culturally inclusive educational programs, activities, or learning styles. We will summarize studies showing the importance of cultural preservation, the effects of cultural discontinuity, and the role of the teacher, presenting two of these studies in some detail. One will demonstrate the impact of cultural discontinuity on academic outcomes, and the other will document the need for culturally competent teachers. We will end with recommendations that successfully address UNCRC Article 30 and we will provide an example of a site where substantial progress has been made towards ensuring that the right to enjoy, practice and use their own cultural traditions can be afforded to all students.

1:45-1:55 pm *In Pursuit of Martin Luther King’s Legacy of Non-Violent Social Change: In Defense of Children’s Right to be Protected from Violent Media*

Caroline Boyd-Rogers, Laura McDowell, and William-Michael Stone

Faculty Sponsor: Marsha Walton, Department of Psychology

Article 17 of the UNCRC advocates the protection of children from damaging or inappropriate material, while retaining their right to have free access to information. We will show how the United States has fallen short of ensuring this protection to our children by allowing unfettered access to violent media. We will describe empirical evidence for the role of violent media in promoting children’s aggressive behavior, focusing on research showing that the connection between media violence and child aggression is mediated by a suppression of empathy. We will end with recommendations that caregivers and teachers take necessary steps to cultivate empathy skills in children from a young age in an effort to mitigate the negative consequences of violent media consumption.

Developmental Science and the Legacy of Martin Luther King: Advocating for the Civil Rights of Children II

2:20-3:35 pm

Clough 302

Moderator: Marsha Walton, Department of Psychology

Throughout this semester, the city of Memphis has been commemorating the 50th Anniversary of the assassination of Dr. Martin Luther King, evaluating the progress we have made toward a more just society and asking where we fall short of the vision Dr. King articulated. Among the many cascading influences of Dr. King’s work has been a movement for children’s rights, a movement that culminated in the 1990 adoption by the United Nations of a set of 41 articles agreed upon by all the member nations, excepting the United States and Somalia, articulating a set of rights that ought to be afforded all children and youth. We have used this semester to consider the United Nations Convention on the Rights of the Child (UNCRC), and to address questions about how theory and research on child development might inform our efforts to realize the vision of a just society described by Martin Luther King. Each of four learning teams has selected one aspect of the UNCRC and will 1) describe where we fall short of compliance with the specific articles of the charter under consideration, (2) present relevant empirical evidence in developmental science, and (3) describe programs or contexts which have been shown to accomplish the aims of those UNCRC articles.

2:20-2:25 pm *Welcome and Introduction to the Session*

André Boulay, Brianna Hardeman, and Annie Nottingham

2:25-2:35 pm *Grow From What You Know: The Rights of Children to Culturally Relevant Learning*

Cleo Nikoden, Annie Nottingham, and Remi Parker

Faculty Sponsor: Marsha Walton, Department of Psychology

Article 28 of the UNCRC guarantees children the right to accessible compulsory and free education and Article 30 guarantees the right to the expression and cultivation of their culture. We are concerned that the implementation of compulsory education has suppressed rather than supported the expression of culture for children in some cultural communities. Compulsory education based on a deficit model attempts to overcome features of family or neighborhood identified as problems. By contrast, a strengths-based model identifies cultural practices that enhance development and encourage the integration of children into their cultural communities. We will present evidence that educational systems across the world have failed to integrate culture into teaching and educational assessment, showing how this failure to combine aspects of the children's cultural traditions with educational practices hinders children's development. We will contrast this with examples of educational systems employing culturally irrelevant teaching or assessment measures. We end with recommendations for the introduction and expansion of culturally relevant teaching practices.

2:35-2:45 pm *An Examination of a Global Failure to Secure the Rights and Protect the Mental Health of Refugee Children*

Cinthya Bolanos Zamora, Brianna Hardeman, and Michalah Haydan

Faculty Sponsor: Marsha Walton, Department of Psychology

We will be dealing with Article 22 of the UNCRC, which concerns the treatment of refugee children, stating that both accompanied and unaccompanied refugee children should have accommodations made for them that ensure their life and dignity, and alleviate their suffering as much as possible. We will look at negative consequences of forced displacement and time spent in detention centers including but not limited to: depression, anxiety, and PTSD, to name a few. In this presentation, we attempt to show that some of the countries who have ratified the UNCRC are not fully aiding the refugee children in alleviating their suffering. We will describe two studies in detail. The first study, from the UK, documents via self-report the number of traumatic events and symptoms of PTSD in refugee children. The second, from Denmark, documents the effects of displacement on the mental health of the children. We will also be summarizing three other studies further describing the effects of fleeing their countries. To end, we will be presenting a list of recommendations both from the literature and from our point of view. We will describe the Refugee Empowerment Program in Memphis which seeks to address these concerns by offering resources, such as education, for refugee children and their families.

2:45-2:55 pm *The Child's Right to Media Access: Educational Media and Technologies in Elementary Schools*

Emma Hauck, Ericka James, and Abigail Smack

Faculty Sponsor: Marsha Walton, Department of Psychology

Our presentation focuses on Article 17 of the Convention on the Rights of the Child, which concerns media that should be accessible to children, as well as the media from which children should be protected. We address this article by focusing on media that should be accessible to children, even though we acknowledge that much of the existing literature and research on media exposure focuses on negative consequences. We discuss how media exposure positively impacts children in educational settings, specifically focusing on e-media/internet-based media, narrowed even further down to educational technologies. To address the nondiscrimination clause from the CRC, we explore how every child deserves media access, but in reality, we document disparities in Internet access. Our presentation takes a strengths approach, focusing on strengths, rather than deficits related to access and consequences of educational technology. We evaluate two model programs of incorporating media in educational settings and we discuss the implications and further actions related to this topic of media access. These studies lead us to affirm the need to give children access to media, and also the importance of training teachers in the use of media and technology to make sure educational media is beneficially incorporated in classrooms.

2:55-3:05 pm *Let There Be Art: A Defense of Children's Right to Create*

André Boulay, Rhiannon Rainey, and Mattie Sullivan

Faculty Sponsor: Marsha Walton, Department of Psychology

Articles 2, 13, 29, and 31 of the Convention on the Rights of the Child address nondiscrimination, freedom of expression, full development of talents, mental and physical abilities, and encouragement to engage in the arts. These form the foundation for our argument that every child should have a right to create. We will present evidence that communities in the United States are falling short of securing this right for our children, despite the evidence that creating art provides lasting benefits for children's social, emotional, and cognitive development. Among these benefits are Ellen Winner's seven habits of mind: developing craft, engaging and persisting, envisioning, expressing, observing, reflecting, and stretching and exploring. Knowing how beneficial creating art can be for children, we turn to Stax Academy in Memphis, Gustavo Dudamel's work in Venezuela, Carpenter Arts Garden in Memphis, and Memphis Symphony's collaboration with Shelby County Schools as guiding examples of how arts for children can be done right.

Developmental Science and the Legacy of Martin Luther King: Advocating for the Civil Rights of Adolescents

3:40-4:55 pm

Clough 302

Moderator: Marsha Walton, Department of Psychology

Throughout this semester, the city of Memphis has been commemorating the 50th Anniversary of the assassination of Dr. Martin Luther King, evaluating the progress we have made toward a more just society and asking where we fall short of the vision Dr. King articulated. Among the many cascading influences of Dr. King's work has been a movement for children's rights, a movement that culminated in the 1990 adoption by the United Nations of a set of 41 articles agreed upon by all the member nations, excepting the United States and Somalia, articulating a set of rights that ought to be afforded all children and youth. We have used this semester to consider the United Nations Convention on the Rights of the Child (UNCRC), and to address questions about how theory and research on adolescent development might inform our efforts to realize the vision of a just society described by Martin Luther King. Each of six learning teams has selected one aspect of the UNCRC and will 1) describe where we fall short of compliance with the specific articles of the charter under consideration, (2) present relevant empirical evidence in developmental science, and (3) describe programs or contexts which have been shown to accomplish the aims of those UNCRC articles.

3:40-3:45 pm *Welcome and Introduction to the Session*

Caleb Fowler, Lauren Hakim, and Davi Hertz

3:45-3:55 pm *Solitary Confinement in the Juvenile Justice System: State-sponsored Torture of Youth in America*

Brad Bierdz, Taylor Duncan, and Davi Hertz

Faculty Sponsor: Marsha Walton, Department of Psychology

Section A of Article 37 of the Conventions on the Rights of the Child states that "No child shall be subjected to torture or other cruel, inhuman or degrading treatment or punishment." The United States is one of two members of the United Nations who have not ratified this declaration, and our evaluation of the practices within US juvenile detention centers and examination of empirical evidence regarding the use and effects of subjecting adolescents to solitary confinement exemplify the US's failure and resistance to comply with this article in the CRC. Evidence of the detrimental psychological and physical harms which result from conditions of solitary confinement speak to the torture that children and adolescents are subjected to while incarcerated. In this investigation, we report this evidence and analyze alternative juvenile justice methods which better align with the ideals explained in the Conventions on the Rights of the Child.

3:55-4:05 pm *Adolescent Rights to Treatment after Trauma: A Proposal for Narrative Therapy*
Caleb Fowler, Jacqueline Paiz, and Jordan Sears

Faculty Sponsor: Marsha Walton, Department of Psychology

Article 39 of the UNCRC requires states to provide for physical and psychological recovery and social reintegration following trauma. Research has shown that most young people recover after trauma and return to normal functioning. Efforts to secure a right to treatment for adolescent victims of violence, abuse and exploitation who do not recover require the development of therapeutic approaches that can promote resilience and restore a sense of well-being. We describe research evidence for the effectiveness of two different types of trauma therapy. A common thread in these is the use of narrative reconstructions of the traumatic events, and we argue that this is effective because it builds on strengths of the traumatized youths.

4:05-4:15 pm *Conflicting Media Messages about Desirable Body Weights and about Food Choices Threaten Adolescent Wellbeing and Violate their Right to Healthy Development*
Anne Cribb, Brealan Muniz, and Taylor Pavlovich

Faculty Sponsor: Marsha Walton, Department of Psychology

Article 17 of the UNCRC underlines the impact that mass media have on a developing mind by stating that a child shall have access to material in the media, especially if it promotes the child's "social, spiritual, and moral well-being and physical and mental health." This presentation will address the detrimental impact mass media have on developing adolescents' perception of food, as well as their relationship with their own bodies. We will show how mass media promotes an ideal body image that is too thin and also promotes the consumption of non-nutritious and high-calorie foods. This juxtaposition has caused two massive concerns: the rise of obesity, and the rise of disordered eating. We will describe two empirical studies that provide evidence that media exposure plays a role in adolescents' food choices which in turn impacts their health. We will also describe the findings of several studies that indicate a relationship between eating habits and obesity, disordered eating, and pubertal timing which can compromise the psychological and physical well-being of adolescents. In response to this research evidence, we recommend that all adolescents participate in a preventative program to educate them about disordered eating and obesity risk factors. An effective intervention of this type is the Media Smart program, which has shown progress in inoculating against dangerous media messages and in guaranteeing adolescents the right to health and nutrition.

4:15-4:25 pm *Moving Towards MLK's Dream for Equality: The Promise of Educational Technologies*

Natalie Arnold, Annika Hedlund, and Katie Imperial

Faculty Sponsor: Marsha Walton, Department of Psychology

Article 28 of the *Convention on the Rights of the Child* states that free and accessible education should be provided for all children. We present evidence that in the United States the quality of education differs for children depending on socioeconomic status, and that opportunities are

inadequate for children with disabilities. We propose that technology can be the promise of equitable educational experiences in the classroom. We describe two research studies, one demonstrating the use of technology to promote educational opportunities for children in low SES communities, and one demonstrating the use of technology to improve access for a child with disabilities. We close with an example of a community that has implemented educational technologies in an effort to further MLK's dream of equality.

4:25-4:35 pm *Literacy Rights in the Twenty-First Century: Reading is Not Enough*

Natalie Campbell, Thomas Mitchell, and Meredith Schoel

Faculty Sponsor: Marsha Walton, Department of Psychology

Article 28 of the UNCRC calls upon the nations of the world to eliminate ignorance and illiteracy throughout the world, while also providing access to contemporary teaching methods. We will present evidence of the United States' failure to meet the spirit of these goals, while also illustrating the impact of these failures upon adolescents. We will describe several empirical studies that discuss the consequences of illiteracy and the implications of literacy education. One presents a comparison of traditional and technologically-assisted literacy practices, and the second is a study of the impact of peer-assistance on literacy development. We will conclude with a recommendation that focuses on improving the effectiveness and accessibility of literacy education that is based upon work taking place within a large, urban school system in the United States. To be clear, our argument here is not that literacy is important-- that is a universally understood truth. Rather, our argument lies in the way that literacy education is approached and our attempt determine the most effective and equitable practice through which the right to literacy may be afforded to all teens and young adults.

4:35-4:45 pm *The Rights of Children to Freely Express Their Opinions: Issues with the U.S. Child Custody System*

Lauren Hakim, Brianna Sprague, and Mackenzie Lampner

Faculty Sponsor: Marsha Walton, Department of Psychology

Articles nine, twelve, and sixteen of the Convention on the Rights of the Child state that all children shall be given the opportunity to be heard freely in all matters affecting them, including in custody cases. In the U.S., states, differ in laws and procedures that regulate custody cases, with many having no provision for hearing the opinion of adolescents about where they should live when their parents separate. We review research showing that when children have their voices heard in custody hearings they feel more content and secure in their court-mandated placements. There are, however, potential problems with giving too much weight to the testimony of youth in situations where they may be unduly influenced by various kinds of pressure and/or when their preferred parent may be involved in criminal activity or may be otherwise unfit. Some studies have shown adolescents expressing discomfort with being given decision making power in custody cases. We describe procedures in one empirical article which outlines alternative processes which allow children to voice their opinions without taking full

responsibility for decision making in their custody cases. We argue that the civil rights of adolescents are best secured when their voices are seriously considered, but when custody decisions are finally made by trained professionals charged with determining their best interests.

FINE ARTS ORAL SESSIONS

Violet: Gritty, Deconstructed Nostalgia in the Year of MLK50

12:30-1:30 pm

Hassell 100

Moderator: Montana Pugh

Violet: Gritty, Deconstructed Nostalgia in the Year of MLK50

Karissa Coady, Jenny Wilson, Emily Murphy, Andrea Pajarillo, Montana Pugh, and Sophia Deck

Faculty Sponsor: Michelle Mattson, Associate Dean of Academic Affairs

Violet: A Musical, a product of a Theatre senior seminar project, is a student-driven collaboration between Rhodes College and The University of Memphis. Violet, our protagonist, experiences internal and external battles as she is exposed to the complexities of the civil rights movement, religion, and the Vietnam War on her journey through the American South. Our production concept for Violet embodies nostalgic realism-- returning to the world of Vietnam-era America, we shift the scope of focus from glorified coasts of the country to “honest-to-God” Middle America. In an effort to maintain a grounded, humanizing element in this musical, we are concerned with preserving the reality of the lives that Violet presents on stage; we are approaching this element in a way that reflects the true nature of this show-- grit. Our production closes just shy of the 50th anniversary of Dr. Martin Luther King’s assassination; a half-century later, we are still facing an extreme amount of racial and religious tension. Memphis is a city that embraces its past in looking toward the future. Through our production concept of “gritty, deconstructed nostalgia,” we hope to inspire dialogues and action outside of the ones we will grapple with inside the rehearsal hall.

Cauthen Competition

1:30-2:30 pm

Tuthill Performance Hall

Moderator: Bill Skoog, Department of Music

The Cauthen Competition: Final Round

Faculty Sponsor: Bill Skoog, Department of Music

Gladys Cauthen was one of the founding influences in the development of the Rhodes College Department of Music, which grew out of the Memphis College of Music. In her honor and

memory, Gladys Cauthen's legacy is remembered through the naming of this solo competition. The winner will perform with the Rhodes College Orchestra in the following academic year.

National Association of Teachers of Singing

2:30-3:00 pm

Tuthill Performance Hall

Moderator: Carole Blankenship, Department of Music

Concert of NATS Student Competitors

Kathryn Brode, Isabel Celata, Cameron Crawford, Raneem Imam, Hannah Oakley, Grace Tomeny, and Camila Zimmerman

Faculty Sponsor: Carole Blankenship and Tom Bryant, Department of Music

Singing competitions sponsored by the National Association of Teachers of Singing are held yearly. For Rhodes voice students that competition occurs in the Mid-South Region of NATS and encompasses schools and voice studios in Kentucky and Tennessee. This April seven students from Rhodes traveled to Northern Kentucky University to participate in that regional audition with the opportunity to advance to the national semi-final level. The students competed in classical and music theatre auditions. For the URCAS presentation each student who competed will sing one of the pieces they submitted and performed for this competition.

Studies of the Past and Present

2:00-3:00 pm

Clough Hall 417

Moderator: Miriam Clinton, Department of Art & Art History

2:00-2:15 pm *Designing for Data: 3D Video Game to Gain Knowledge of the Ancient Minoans*

■

Kathryn Clark and Baobao Wang

Faculty Sponsor: Miriam Clinton and Darren Floyd, Department of Art & Art History

This paper presents research completed as part of a Lynne and Henry Turley Memphis Center Fellowship in the Arts. We have created an online game using a 3D model of an ancient structure from the Minoan period in Greece, ca. 1450 BCE. This game is designed not only to be an educational learning tool about ancient Minoan culture, but also to collect information about how people move within the structure. This game will allow researchers to analyze data and more accurately conclude how the structure would have acted as a domestic and ritual space. This paper both presents the game itself in its final version and discusses the process of collaborating as a multidisciplinary team interested in art history and game design. It includes information on the game design planning and creation process, especially how the team has been influenced by the field of digital humanities, and explores how this game will impact art historical conclusions about the Minoans.

2:15-2:30 pm *A Reception Study of William Eggleston's Untitled, 1975*

Mary Phan

Faculty Sponsor: Miriam Clinton, Department of Art & Art History

“Marcia whacked out on Quaaludes.” According to Winston Eggleston, this is how his father, photographer William Eggleston, always referred to his 1975 piece, *Untitled*. The photograph, taken in Memphis, Tennessee, shows the artist’s then-girlfriend and muse, Marcia Hare, sprawled out on grass, with closed eyes and mouth parted just slightly, her expression is intriguing and ambiguous, somewhere in the realm of serene and anguished. Alongside the elusive *Untitled* name of the piece, without intimate information, the subject is equally mysterious to her audience. This mystery guides the viewer to assign a narrative to the piece, and if not that, then to absorb the captivating yet ambiguous visuals of Eggleston’s work. Eggleston’s portrait of Marcia Hare captures the saturated hues and light of Eggleston’s primary working environment, the Delta South. The photograph of Marcia Hare stands alone as one of Eggleston’s most famous works. Like much of Eggleston’s work, it is considered pioneering and quintessentially modern. But Eggleston’s *Untitled* does not exist in isolation from the past. This paper will explore how William Eggleston’s 1975 picture of Marcia Hare appropriates form, subject, and themes from art historical canon and convention.

2:30-2:45 pm *Fragmenting The Canon: Womanhouse’s Postmodernist Reception of The Female Nude*

Montana Pugh

Faculty Sponsor: Miriam Clinton, Department of Art & Art History

In traditional male-centric art stemming from the western canon, art plainly speaks to both sexes by omitting a female narrative: while the canon features female subjects, many of the most famous women in art are objectified as they are portrayed nude or partially nude. Through carefully crafted Modernist language and consciously female-centric content, CalArts’ first Feminist Art Program produced the *Womanhouse* project in 1972 which successfully addressed both sexes by noticeably directing their attention to the embodiment of the female experience. Using Modernist language to present woman-centric content was a meticulously outlined, and inarguably successful Postmodernist tactic. The fundamental factor to that success, however, was their application of Jacques Derrida’s theory of fragmentation within the Postmodernist tradition to reclaim the female nude from its long history of creation and study under the “male gaze.” This paper moves to show that the women of *Womanhouse* were deeply affected by their reception of the traditional canon of art; to firmly establish Feminism as a viable movement, they cloaked their art in Modernist “male drag,” as a Postmodernist reception of art through the method of deconstructing male produced images of female bodies to create a female-centric narrative within the canon.

2:45-3:00 pm *From Pergamon to Beckmann: An Examination of the Thematic Use of Pain in the Western Canon*

Rachel Rotter

Faculty Sponsor: Miriam Clinton, Department of Art & Art History

Max Beckmann's *The Night* (1919) is his response to the traumas of World War I. Produced one year after the war, Beckmann used this piece and its theme of pain to ruminate on hopelessness effected by violence and the loss of social and political stability in Germany. Given these circumstances, *The Night* is considered a unique product of the twentieth century; its modern composition only reinforces this thinking. However, the use of pain in response to trauma renders *The Night* unexceptional. Equally turbulent circumstances have produced this reaction throughout the Western Canon. If we compare the conditions which surrounded the creation of works like *The Night*, such as the Pergamon Altar (ca. 160 BC) and Artemisia Gentileschi's *Judith Slaying Holofernes* (1620), we may better understand why humans depict pain to grapple with contemporary issues. Thus, I propose a reception study not based on direct reference, but on unconscious allusion as each piece depicts pain for the same goal – universality. Ultimately, this will demonstrate that Beckmann, along with any artist, can be reinterpreted as part of new traditions, as his unconscious references to past works sheds light on their meanings and vice versa – the primary goal of the study of reception.

FRESH: A Performance Art Showcase

3:00-5:00 pm

Clough Hall 312

Moderator: Joel Parsons, Department of Art & Art History

Sara Lynn Abbott, Mattie Boyd, Roland Donnelly-Bullington, Darah Fuller, Hope Hudson, Melissa Kiker, Emily Murphy, Annie Netterville, Elise Rawlinson, and Qian Xu

Faculty Sponsor: Joel Parsons, Department of Art & Art History

FRESH is the fourth iteration of the Introduction to Performance Art showcase, featuring performances by 10 students engaging in a variety of performative modes and a range of content, but all asking how space, time, and presence can combine to create extraordinary experiences.

Studio Art Senior Thesis Exhibition: Enter Through the Window

4:00-5:00 pm

Clough-Hanson Gallery

Moderator: Ryan Rasmussen, Department of Art & Art History

Reagan Alley, Frank Beiser, Mattie Boyd, Erin Burman, Hope Hudson, and Olivia Thomas

Faculty Sponsor: Ryan Rasmussen, Department of Art & Art History

Graduating senior studio art majors discuss their individual research, processes, and resulting artwork, which is currently on display in Clough-Hanson Gallery as part of the Senior Thesis Exhibition.

SCIENCE ORAL SESSIONS

Quantitative and Computational Science I

1:30-2:00 pm

FJ-A

Moderator: Austin Barringer

1:30-1:45 pm *Crave It: A Food Delivery Solution for Gated Campus Communities*

Avery Blankenship, Michelle Ngo, and Alex Stickler

Faculty Sponsor: Betsy Sanders, Department of Mathematics & Computer Science

CraveIt is a mobile application that provides residents of gated campus communities with a more efficient food-delivery option. Present food delivery options are both limited by the presence of a gate which requires student IDs for entry onto campus as well as a standard delivery fee which is not always proportional to the cost of a meal. By allowing students to act as deliverers, CraveIt overcomes the stubborn boundaries presented by a gated campus that can lower accessibility. Additionally, CraveIt implements a system that only allows students to request food from fellow students who are already planning on dining out, thus eliminating the need for a standard delivery fee. By tackling the problems of ease and affordability, CraveIt provides a solution to food delivery which is both more accessible and more cost efficient than present options.

1:45-2:00 pm *Algorithmic Generation of Ragtime Music*

Zaid Baba

Faculty Sponsor: Philip Kirlin, Department of Mathematics & Computer Science

Previous student work at Rhodes has yielded a probabilistic generation algorithm for ragtime songs given popular, easily-recognizable melodies as input. A database of 11,000 ragtime piece is used to extract common rhythms characteristic of the genre. These are then applied to the input songs by shifting the original melodies to fit this on a per-measure basis. The goal of this project is to replicate the algorithm and improve upon it using the framework of Python's music21 module. Modifications to the original approach in order to yield more natural results, effectively retooling the algorithm to better emulate ragtime renditions.

Quantitative and Computational Science II

2:30-3:15 pm

FJ-A

Moderator: TBD

2:30-2:45 pm *Offloading Active Messages to Hardware in a Partitioned Global Logical Address Space*

John Snyder and Brian Larkins, Department of Mathematics & Computer Science

Faculty Sponsor: Brian Larkins, Department of Mathematics & Computer Science

The use of accelerators in High Performance Computing has become popular due to their lower power consumption relative to CPUs. With the creation of new network interface controllers(NIC) with increased computing power, we can utilize the power of these NICs to handle lightweight computations to alleviate stress normally put on the CPU. We propose a way to utilize the computing power of these new NICs as accelerators to process Active Messages, adding more computing power to the system, while also reducing power consumption and increasing speed.

2:45-3:00 pm *Evaluating Empathy in Virtual Reality*

Zaid Baba, Kathleen Blanck, and Mack House

Faculty Sponsor: Betsy Sanders, Department of Mathematics & Computer Science

One of virtual reality's primary goals is to offer the user an immersive experience in a computerized environment. This suggests that the user maintains a strong connection with the media presented to them, as the interactions between the virtual and the real become much closer. Therefore, it can be said that virtual reality serves as a good "empathy machine," allowing people to resonate strongly with any characters depicted in it. The goal of this study is to verify this claim by presenting subjects with a fictional bullying scenario in both an HTC Vive virtual reality headset and a standard on-screen display. The degree to which participants express empathy for the victim in the scene in these two will be evaluated.

3:00-3:15 pm *Avalon*

Levi Greenberg, Will Cobb, Spencer Franklin, and Patrick Richardson

Faculty Sponsor: Betsy Sanders, Department of Mathematics & Computer Science

Avalon is a new website that will offer Rhodes students and faculty an up-to-date and user-friendly addition to Banner Web. The project team includes Will Cobb, Spencer Franklin, Levi Greenberg, and Patrick Richardson. We are building the system using python scripts to scrape the BanWeb server and a Python flask server to serve webpages. In order to access all the pages of BannerWeb and DegreeWorks we use the python library mechanize which emulates a normal user's browser. From there we intercept all network traffic sent to the mechanize browser. We parse the HTML with the python library BeautifulSoup. BeautifulSoup combines regular expressions with XML parsing and lets us separate and record pieces of data. Our flask server

will serve a standard web app that provides users an interface to interact with Banweb. Actions taken on the web page will either be stored in a local database or will be translated into actions that need to be taken on Banweb. Each user will have a browser process running on our server that will interact with BanWeb on their behalf. On the site, users will find a more attractive and effective way to deal with their student affairs.

Quantitative and Computational Science III

3:30-4:15 pm

FJ-A

Moderator: Eleanor Hook

3:30-3:45 pm *On the Derivation and Analysis of the Bivariate Hilbert Series of a Circle Action* ■

Saad Khalid

Faculty Sponsor: Christopher Seaton, Department of Mathematics & Computer Science

The aim of this project is to generalize existing computations of the univariate Hilbert Series, $H(x)$, for cotangent lifted circle actions to the bivariate case, $H(x_1, x_2)$. This results in the ability to distinguish between polynomials in (z_1, \dots, z_n) and (w_1, \dots, w_n) when counting, leading to more precise information about the invariant polynomials. This is in contrast to only being able to specify the degree of a monomial as a whole in the univariate case. For example, the univariate Hilbert series may tell us that a group has 3 invariants of degree 2. This means that there are 3 invariant monomials in the form z_i^2 , $z_i w_j$, or w_j^2 . Using the bivariate expansion, we could find that there are exactly two invariants of the form z_i^2 and one invariant of the form $z_i w_j$. We also aim to generalize computations of something called the Laurent coefficients of the Hilbert series, which are the coefficients of the series expansion of the Hilbert series at a singularity, specifically at $(x_1, x_2) = (1, 1)$, $(1, 0)$, and $(0, 1)$. We have also generalized an algorithm for the computation of a univariate Hilbert Series of a circle action to the bigraded case.

3:45-4:00 pm *Exploring Linear Relations Among Laurent Coefficients of Certain Hilbert Series* ■

Austin Barringer

Faculty Sponsor: Christopher Seaton, Department of Mathematics & Computer Science

In [Herbig-Herden-Seaton, arXiv:1605.01572 [math.CO] 2016], the authors considered rational functions of one variable, t , that satisfy a functional equation $h(t)$. The function is in terms of integers a and d , where d is the pole order of $h(t)$ at $t=1$. They found that depending on the value of r , where $r=-(a+d)$, the coefficients of the Laurent expansion at $t=1$ satisfy various triangular linear relations, and so formed structures like that of Pascal's triangle or the Lucas triangle, for example. In this project, we experimentally investigate the extension of their findings, using a large collection of functions of two variables t_1 and t_2 that satisfy an analogous equation. We explore, using series expansions on Mathematica, whether the two variable functions are characterized by similar linear constraints (defined iteratively as the Laurent coefficients at $t_2 = 1$

of the Laurent coefficients at $t_1 = 1$). Our results suggest that there do seem to be similar relations, indicating a possible generalization to this case. Beyond the scope of this project, the motivation for studying these relations is as follows. By a theorem of R. Stanley, a graded Cohen-Macaulay domain A , where a is the a -invariant, is Gorenstein if and only if its Hilbert series satisfies the functional equation given above.

4:00-4:15 pm *Characterization of weight matrices that induce torus actions of different properties*

Yi Song

Faculty Sponsor: Christopher Seaton, Department of Mathematics & Computer Science

Symplectic manifolds arise as geometrical representations of classical mechanical systems. We focus on the study of symplectic quotients, which are quotients of symplectic manifolds by symmetries of the system. The simplest quotients are by finite groups of symmetries and are known as orbifolds. However, it has been observed that more complicated symplectic quotients can sometimes but not always be identified with orbifolds. In fact, previous work by Herbig-Schwarz-Seaton has shown that if the group action of a torus on a complex space has certain properties, called 2-principal and stable, then there does not exist a symplectomorphism between the symplectic quotient and a linear symplectic orbifold. In another word, properties of the torus actions have implications on the connection between the symplectic quotients and orbifolds. My research focuses on characterizing the weight matrices that induce k -principal and stable torus actions. I will present progress towards determining such a characterization of the weight matrix.

The Natural World I

1:30-2:15 pm

Robertson 110

Moderator: Andrea Pajarillo

1:30-1:45 pm *COMT Enzyme Inhibition with Novel Catechol Compounds*

Grace Kennedy and Katherine Hatstat; Mauricio Cafiero and Larryn Peterson, Department of Chemistry

Faculty Sponsor: Larryn Peterson, Department of Chemistry

Dopamine is a catecholic neurotransmitter essential for proper human functioning, controlling mood, cognition and coordination. Dopamine deficiency is the main cause of Parkinson's disease. Dopamine itself cannot be used as a treatment for Parkinson's disease, as the net charge on the molecule prevents it from crossing the blood brain barrier. L-DOPA, a dopamine precursor, is neutral; it can enter the brain, where it is later converted into dopamine. L-DOPA is metabolized too early in the peripheral tissues by catechol-O-methyltransferase (COMT). This premature modification of L-DOPA decreases the amount available for the brain to utilize. Thus, inhibition of COMT would stop early metabolism and allow L-DOPA to reach its desired target in greater quantities. This work discusses the synthesis and testing of novel dopaminergic and

catecholic compounds, highlighting the stability via HPLC analysis and the inhibition capabilities in an enzymatic assay of these potential COMT inhibitors.

1:45-2:00 pm *Computational Analysis and Synthesis of Potential Inhibitors Active Against Gram-negative Bacteria*

Rebeca Roldan, Andrea Pajarillo, and Carter Embry; Mauricio Cafiero and Larryn Peterson, Department of Chemistry

Faculty Sponsor: Larryn Peterson, Department of Chemistry

LpxC, an enzyme involved in the first committed step of the biosynthesis of lipid A, has been found to be a crucial drug target. This inhibition is critical for developing novel antibacterial treatments, especially with the growing resistance Gram-negative bacteria is having towards already developed treatments. Through the computational analysis of the crystal structure of LpxC and its active site, novel inhibitors have been designed to mimic the natural substrate of LpxC. The computational analysis and synthesis of these analogues, as well as their chemical stability and preliminary antibacterial activity, will be discussed.

2:00-2:15 pm *Design, Modeling, and Synthesis of Non-Nucleosides as Potential Inhibitors of LpxC* ■

Carter Embry, Rebeca Roldan, Andrea Pajarillo, and Mauricio Cafiero, Department of Chemistry

Faculty Sponsor: Larryn Peterson, Department of Chemistry

Gram-negative bacteria have become increasingly resistant to known antibiotic treatments, necessitating the discovery of new treatment mechanisms. LpxC catalyzes the first committed step in the biosynthesis of lipid A, a component of the outer membranes of Gram-negative bacteria, making it a promising target for inhibition. Using known characteristics of the active site, potential inhibitors were designed to optimally bind and inhibit LpxC. Non-nucleoside analogues of the natural substrate were chosen to improve interaction with the zinc ion and hydrophobic region. The analogues were positioned in the LpxC active site, and their structures were optimized in silico using a two-layer DFT/PM6 ONIOM model with explicit solvation. The ligand-protein interaction energies were calculated at the DFT level. Compounds with the most favorable interactions were synthesized and characterized with the intent to study their antibacterial activity.

The Natural World II

1:30-2:15 pm

FJ-D

Moderator: TBD

1:30-1:45 pm *Ybx1 interacts with the PRC2 complex in early neural development*

Jennifer Loome and Jamy Peng, St. Jude Children's Research Hospital

Faculty Sponsor: Jamy Peng

The Polycomb Repressive Complex 2 (PRC2) epigenetically regulates gene expression during early embryonic development. PRC2 methylates histone 3 lysine 27 associated with its target genes, leading to chromatin compaction of the target genes. Its gene targeting is governed by JARID2, whose activities are poorly understood. Our studies of PRC2 and JARID2 led to the identification of a new binding protein, Y-box-binding protein 1 (YBX1). Here, we report our biochemical and genetic characterizations of Ybx1. Jarid2 null mice develop a distinctive exencephaly phenotype, indicating that its activity is essential for early development. Knockout of the gene Ybx1 yields a similar phenotype, suggesting a functional relationship between these genes. Here, we confirmed that JARID2 physically binds with YBX1 in human embryonic stem cells, mouse neural tube, and in vitro as recombinant proteins. We demonstrate that knockout of Ybx1 leads to overgrowth of mouse neural progenitor cells (NPCs), and gene expression profiling revealed that YBX1 null NPCs have altered expression of genes involved in forebrain development. We are characterizing the effect of Ybx1 over NPC differentiation. Our findings indicate that Ybx1 is essential to early mammalian neural development and suggest that Ybx1 regulates PRC2 activity.

1:45-2:00 pm *Understanding RevCen mediated heterochromatin establishment in S. pombe*

Patrick Smith, Abby Ellingwood, Yanai Almalem, and Bayly Wheeler, Department of Biology

Faculty Sponsor: Bayly Wheeler, Department of Biology

Eukaryotic genomes are packaged into two types of chromatin: euchromatin and heterochromatin. Formation of heterochromatin at a specialized locus, called the centromere, is important for the division of genetic information between two cells. In fission yeast, heterochromatin forms at repetitive DNA sequences, including RevCen, a short transcript found within all three centromeres. RevCen transcripts are processed by the RNAi pathway, which enables RevCen to establish heterochromatin. RevCen can recruit heterochromatin and silence gene expression when removed from the centromere, suggesting that RNAi machinery is targeted to RevCen by specific sequences. To identify sequences within RevCen that are important for heterochromatin establishment, we deleted an siRNA-producing domain from the RevCen transcript. Because this domain is perfectly conserved among all copies of RevCen, we predicted it would be important for heterochromatin establishment. However, we show that this deletion did not impact the ability of RevCen to silence gene expression. This finding suggests

that domains within RevCen may function redundantly to establish heterochromatin. Next, we will use an artificial chromosome assay to determine whether RevCen itself is redundant with other heterochromatin establishment sequences present within the centromere. Together, this work will define the extent of redundancy within and between heterochromatin establishment sequences.

2:00-2:15 pm *The Preventable Shunt Revision Rate: A Multicenter Evaluation* ■

Pooja Dave, Rhodes College; Garret Venable, Tamekia Jones, Nickalus Khan, and Paul Klimo, Jr., University of Tennessee Health Science Center; Gregory Albert, Arkansas Children's Hospital, University of Arkansas; Joshua Chern and Jennifer Wheelus, Emory University; Lance Governale, University of Florida; Kristin Huntoon, Ohio State University; Cormac Maher and Amy Bruzek, University of Michigan; Francesco Mangano, Cincinnati Children's Hospital Medical Center; Vivek Mehta and Wendy Beaudoin, Stollery Children's Hospital; Robert Naftel, Jade Basem, and Anna Whitney, Vanderbilt University Medical Center; Nir Shimony and Luis Rodriguez, Johns Hopkins All Children's Hospital; and Brandy Vaughn, Le Bonheur Children's Hospital
Faculty Sponsor: David Kabelik, Department of Biology

Introduction. The Preventable Shunt Revision Rate (PSRR) was recently introduced as a novel quality metric. **Methods.** Nine participating centers in North America provided at least 2-years of consecutive shunt operations. Index surgery was defined as new shunt implantation or revision of an existing shunt. For any index surgery that resulted in a reoperation within 90-days, demographic, clinical, and procedural information was collected to determine whether the failure was potentially preventable. The 90-day failure rate and PSRR were calculated per institution and combined. Bivariate analyses were performed followed by a final multivariable model using a backward model selection approach. **Results.** 5,092 shunt operations were performed; 861 failed within 90 days of index operation, resulting in a 16.9% combined 90-day failure rate (Med=17.6%; range, 8.7–26.9%). Of the failures, 307 were potentially preventable (combined PSRR=35.7%, Med. PSRR=33.9%; range, 16.1–55.4%). The most common etiologies of avoidable failure were infection (n=132, 43%) and proximal catheter malposition (85, 27.7%). Independent predictors of preventable failure (p<0.05) were lack of endoscopy (OR=2.26), recent shunt infection (OR=3.65), shunt type (OR=2.06) and center. **Conclusion.** PSRR is variable across institutions. While the PSRR may never reach zero, this study demonstrates that about 33% of early failures are potentially preventable.

The Natural World III

2:30-3:15 pm

Robertson 110

Moderator: Grace Kennedy

2:30-2:45 pm *DFT Study of the Selectivity of DOPA-Decarboxylase* ■

Emily Harrison and Abby Ritter; Larryn Peterson and Mauricio Cafiero, Department of Chemistry

Faculty Sponsor: Mauricio Cafiero, Department of Chemistry

L-DOPA is commonly used as a treatment for patients with conditions such as Parkinson's disease. When administered clinically, L-DOPA is converted into dopamine by DOPA-decarboxylase. Once converted to dopamine, clinically administered L-DOPA cannot cross the blood brain barrier, making it pharmacologically ineffective. Therefore, DOPA-decarboxylase can be inhibited in the periphery to prevent negative side effects from administration of L-DOPA treatment and increase its effectiveness. This can be accomplished by selectively designing an inhibitor for the DOPA-decarboxylase enzyme. The inhibitory effectiveness of these dopaminergic derivatives can be measured via the strength of interaction energies between the substrate and the enzymatic active site. The crystal structure of DOPA-decarboxylase enzyme with the known Carbidopa inhibitor was obtained from the Protein Data Bank (PDB ID: 1JS3). Various dopaminergic derivatives and their carboxylated counterparts were optimized in the active site using MO62X/6-31G with implicit solvation and flexible amino acid side chains. Interaction energies between the ligands and the amino acid residues in the active site were calculated using M062X and MP2 with the 6-311+G* basis set. Currently, 6-cyanodopamine appears to be an effective competitive inhibitor of the DOPA-decarboxylase enzyme. Additionally, the binding energies of PLP, an important cofactor in the DOPA-decarboxylase active site and different mutations are being studied.

2:45-3:00 pm *DFT Analysis of the Selectivity of Phenylalanine Hydroxylase* ■

Madison Perchik and Rachel Giampapa; Larryn Peterson and Mauricio Cafiero, Department of Chemistry

Faculty Sponsor: Mauricio Cafiero, Department of Chemistry

There are many molecules that act on dopamine and dopamine-like binding sites in enzymes and transport proteins. Some effects of these proteins are beneficial while others are detrimental. We are designing inhibitors for this group of proteins. Phenylalanine hydroxylase (PheOH) is a tetrahydrobiopterin-dependent monooxygenase that influences the rate determining step of converting phenylalanine into tyrosine by hydroxylating phenylalanine. Both phenylalanine and tyrosine are important components in the anabolism of dopamine. A deficiency of PheOH can cause hyperphenylalaninemia, which gives rise to phenylketonuria (PKU), a severe disease that can cause mental retardation if one's diet isn't strictly monitored. A suite of dopaminergic derivatives has been developed as potential inhibitors of the PheOH enzyme. The inhibitory

effectiveness of these dopaminergic derivatives has been measured via in silico models in which the strength of interaction between each substrate and the enzymatic active site was analyzed. A crystal-structure of the PheOH active site, with bound thienylalanine, was isolated from the Protein Data Bank (PDB ID: 1KW0). The positions of novel dopaminergic derivatives were optimized in the active site using M062X/6-31G with implicit solvation and with flexible amino acid side-chains. Interaction energies between the ligands and the protein were calculated using M062X and MP2 with the 6-311+G* basis set. From recent studies, there are promising novel catechols that do not inhibit this enzyme.

3:00-3:15 pm *Preventing Outer Membrane Formation in Gram-Negative Bacteria: Design and Synthesis of Potential LpxC Inhibitors*

Andrea Pajarillo, Rebeca Roldan, Carter Embry, Sarah Malkowski, and Gene Lamanilao; Mauricio Cafiero and Larryn Peterson, Department of Chemistry

Faculty Sponsor: Larryn Peterson, Department of Chemistry

The increasing global incidence of antibiotic-resistant Gram-negative bacteria necessitates the discovery of new treatment mechanisms to combat such untreatable and deadly infections. One promising target is LpxC, a highly conserved Gram-negative enzyme which performs a crucial step in the Lipid A biosynthetic pathway. Lipid A serves as the anchor for lipopolysaccharides on the outer membrane and is essential to the structural integrity and viability of the bacterium. The LpxC active site is comprised of a zinc ion, a polar region, and a hydrophobic passage. A library of nucleoside conjugates with varying hydrophobic tails similar in structure to the natural substrate were designed, synthesized, and evaluated as potential inhibitors with the intention of optimized binding within the active site.

The Natural World IV

2:30-3:15 pm

FJ-D

Moderator: Patrick Smith

2:30-2:45 pm *Gaining Insight into the Efficacy of CD8+ T cell Responses in Resolving Influenza Virus Infection through Mathematical Modeling*

Maggie Myers, Rhodes College; Amber Smith, University of Tennessee Health Science Center, Department of Pediatrics; Veronika Bernhauerová, Institut Pasteur, Department of Virology

Faculty Sponsor: Erin Bodine, Department of Mathematics & Computer Science

Influenza A virus (IAV) infections pose a considerable public health threat and are a leading cause of death. Understanding how virus is controlled by immune responses is critical to combating the infection and developing effective therapies. Viral loads often exhibit biphasic decay, where the latter phase of rapid clearance is primarily due to effector CD8+ T cells. Linear mass-action clearance by CD8+ T cells cannot reproduce this kinetic feature, suggesting

underlying non-linearity in the efficiency of T cells. To further investigate the efficacy of the CD8+ T cell response and its role in virus resolution, we collected quantitative data using mice infected with Influenza A/PR8 and developed a kinetic model that quantifies the CD8+ T cell response and how it affects different phases of virus clearance. Our results indicate that the rate of virus-infected cell clearance by effector CD8+ T cells depends on the density of infected cells, and that the infection resolution is more sensitive to the effector T cell response robustness than to the rate of infected cell clearance. Together, these results provide well-characterized representations of IAV infection dynamics and insight into T cell cooperation, therapeutic strategies, and the regulation and efficiency of CD8+ T cell-mediated viral control.

2:45-3:00 pm *Geographic Distribution of Yellow Fever Deaths During the 1878 Epidemic in Memphis, TN*

Casey Middleton, Cailey Kesselring, and Erin Bodine, Department of Mathematics & Computer Science

Faculty Sponsor: Erin Bodine, Department of Mathematics & Computer Science

Yellow fever is a viral hemorrhagic fever transmitted by the *Aedes aegypti* mosquito that causes fever, myalgia, nausea, vomiting, jaundice, and death in some cases. During the early 1800's, the United States had several devastating yellow fever outbreaks that killed thousands in cities across the country, but the worst recorded outbreak occurred in Memphis in 1878, leading to approximately 17,000 infections and over 5,000 deaths between the months of July and December. We have created daily death distribution heat maps to show the spread of yellow fever throughout Memphis during the 1878 epidemic using death data published in 1879. Additionally, we have created vector data for Memphis streets, bodies of water, and buildings from 1873, as well as heat maps depicting the racial distribution in Memphis during the 1878 yellow fever epidemic.

3:00-3:15 pm *Using Agent-Based Modeling to Understand Transmission Dynamics & Initial Conditions of the 1878 Memphis Yellow Fever Epidemic*

Casey Middleton, Erin Deery, Jordan Ankersen, Cailey Kesselring, Elisabet Olsen, and Erin Bodine, Department of Mathematics & Computer Science

Faculty Sponsor: Erin Bodine, Department of Mathematics & Computer Science

Yellow fever is a viral hemorrhagic fever transmitted by the *Aedes aegypti* mosquito. During the early 1800's, the United States had several devastating yellow fever outbreaks that killed thousands in cities across the country, but the worst recorded outbreak occurred in Memphis in 1878, leading to approximately 17,000 infections and over 5,000 deaths between the months of July and December. We developed a spatially explicit model that simulates the dynamics of the 1878 yellow fever epidemic in Memphis as it spread through human and mosquito populations using death distribution data from the 1878 epidemic. This model also incorporates meteorological data on temperature and rainfall as well as spatial data imported from QGIS to better estimate the mosquito population throughout the epidemic and replicate the spread of

disease from the Mississippi River waterfront. Using this model, we estimate the human-to-mosquito and mosquito-to-human transmission rates of yellow fever and the population size of mosquitoes at the onset of the epidemic.

The Natural World V

3:30-4:15 pm

Robertson 110

Moderator: Jennifer Loome

3:30-3:45 pm *New Tools for Autoimmune Kidney Disease: Rational Design of Antigen Binding Monobodies*

AliReza Zaravar, Xavier May, and Shana Stoddard, Department of Chemistry

Faculty Sponsor: Shana Stoddard, Department of Chemistry

Current therapeutic options for autoimmune kidney disease (AKD) involve the use of nonspecific immunosuppressive medications that weaken the entire patient's immune system. These therapies leave the patient more prone to contracting basic infections. Therefore, more targeted approaches, which suppress only the portion of the immune system that contributes to the AKD are needed. In our work we have rationally designed and computationally evaluated over two hundred antigen binding monobodies (ABP) to the phospholipase A2 receptor (PLA2R) antigen, which contributes to the AKD idiopathic membranous nephropathy (IMN). Antigen binding monobodies were optimized using in silico mutagenesis, homology modeling using Phyre2, and protein-protein docking using Rosetta. Initial binding energy, measured in rosetta energy units (REUs), was -3.736 for the ySMB-1 template. In silico mutations to the ySMB-1 template have improved the binding score to -6.432 REU. Our results show several important interactions lead to improved binding scores of the ySMB-1 template to the PLA2R antigen in IMN. Experimental verification of binding of the ySMB-1 monobody candidates to confirm binding to the PLA2R antigen are underway. This work could assist in developing targeted therapeutic approaches for AKD.

3:45-4:00 pm *Do single nucleotide polymorphisms create immunogenic sites? Tools for the design of epitope binding monobodies for the autoimmune kidney disease* ■

Colin Welsh, Candace Hayes, Xavier May, and Shana Stoddard, Department of Chemistry

Faculty Sponsor: Shana Stoddard, Department of Chemistry

Autoimmune disorders (AD) are a type of disease in which an individual's immune system attacks the cells of its own body. Currently, AD are the 2nd leading cause of chronic illness. The primary method of treating AD is the use of non-specific immunosuppressant drugs, which suppresses the entire immune system. Antigen-specific therapies have been proposed in order to replace treatment with immunosuppressant drugs for AD. The work here focuses on developing a new approach to AD therapy which targets the epitope site (ES) on the antigen, with an emphasis on the kidney specific AD idiopathic membranous nephropathy, which affects 10-12 million

people worldwide. Using *in silico* mutagenesis the ES on the phospholipase A2 receptor (PLA2R) were predicted and epitope binding proteins (EBP) were developed to target these regions. Using Epitopia and EPCES two regions on the CTLD1 domain of PLA2R were identified as potential ES. *In silico* prediction of immunogenicity showed that single nucleotide polymorphisms do not directly contribute to immunogenic sites on PLA2R. *In silico* mutagenesis of two protein templates (5IMK and 4JE4) was performed to design EBP structures. The Rosetta protein-protein docking server was used to evaluate the strength of binding of designed EBP to the PLA2R antigen, and disruption of binding to their original binding partner. The potency of the 5IMK original monobody template was increased from -4.259 rosetta energy units (REU) to -8.903 REU. Similarly, the potency was increased from -3.964 REU to -5.867 REU for the 4JE4 monobody template. Effective disruption of 5IMK and 4JE4 binding to the original targets through *in silico* mutation was shown to be effective. Binding potency was reduced from -7.851 REU to -3.87 REU for 5IMK, and from -12.263 REU to -3.693 REU for 4JE4. This work could be used to develop a new antigen specific approach for AD therapy.

4:00-4:15 pm *Design, Synthesis, and Affinity of Dopaminergic Derivatives in Human Cytosolic Sulfotransferase SULT1A3*

Skyler Cochrane and Diana Bigler; Mauricio Cafiero and Larryn Peterson, Department of Chemistry

Faculty Sponsor: Larryn Peterson, Department of Chemistry

Sulfotransferases (SULTs) catalyze the transfer of a sulfonyl group from 3'-phosphoadenosine-5'-phosphosulfate to various substrate molecules. This study focuses on SULT1A3, which displays specific substrate affinity for catecholamines, like dopamine. The factors governing SULT1A3's substrate selectivity are not well understood, although research has shown four amino acids are the main contributors to the binding and enzymatic activity. In order to further investigate the factors governing SULT1A3's activity, a library of novel dopaminergic derivatives with varying substituents on the ring and tail moieties were synthesized to determine if these modifications would have an effect on the binding and catalytic activity of SULT1A3. The derivatives have been tested computationally via *ab initio* modeling and experimentally in an HPLC-based SULT1A3 enzymatic assay. The complete narrative from design to biological evaluation will be discussed, providing insight about the influencing factors of SULT1A3's catalytic activity and the sulfation of dopamine and related analogues.

The Natural World VI

3:30-4:00 pm

FJ-D

Moderator: TBD

3:30-3:45 pm *A Quantitative Characterization of Amino Acid and Fatty Acid Metabolism in Cancer Cells*

Zaid Ahmad

Faculty Sponsor: Erin Bodine, Department of Mathematics & Computer Science

Constraint Based Modeling is a biochemical modeling technique that has been used to analyze structural metabolic features of various organisms and cell types. Constraint based modeling uses Flux Balance Analysis, a linear mathematical procedure which determines the set of reaction fluxes to produce a maximum flux of a reaction of interest. In this project, a core cancer model developed by Zielinski et al. 2017 is constrained by a set of 59 cancer cell type uptake and secretion rates. Various objectives are maximized in order to determine the relative contribution of different reactions for certain cellular goals, including biomass, ATP, NADPH, cholesterol and amino acid production. Results indicate that the contribution of exogenous serine to internal serine consumption is highly variable across the 59 cell types while the contribution of Citrate Synthase and Aconitate Hydratase to cellular acetyl CoA production is more uniform and. The role of pyruvate dehydrogenase in biomass production is also assessed and compared to lactate dehydrogenase across different objective conditions.

3:45-4:00 pm *STAR Communities*

Kathryn Brode

Faculty Sponsor: Michael Collins, Department of Biology

Sustainability Tools for Assessing and Rating Communities (STAR Community) is a program that municipal communities can join. The STAR Community program gives communities tools that allow them to become more environmentally sustainable. After an initial assessment, the community is scored on a points system and given a graded level of achievement. Evaluation measures are built environment; climate and energy; economy and jobs; education, arts, and community; equity and empowerment; health and safety; natural systems; and innovation. Within each evaluation measure are subcategories that are assigned a certain number of points, some being outcome points, and some being actions points. Communities are required to reapply with STAR Communities every few years, at which time, updated data are compiled. In many cases, communities that failed certain areas or measures the last time they certified can gather data proving that they have made strides in becoming more sustainable. When a report is submitted, a STAR Community employee will perform an overview of the report, making sure that each measure was executed, giving each measure a failed, passed, overridden, or partial point status. Communities can then reevaluate their report before final submission. The STAR Community program serves to encourage municipalities to become environmentally sustainable.

The Physical World I

1:30-2:15 pm

FJ-C

Moderator: Yi Song

1:30-1:45 pm *Ultrasonic backscatter measurements of bone: relation to tissue microstructure*

Jordan Ankersen, Evan Main, and Luke Fairbanks

Faculty Sponsor: Brent Hoffmeister, Department of Physics

Ultrasonic backscatter techniques are being developed to detect changes in bone caused by osteoporosis. One technique, called the apparent backscatter technique, analyzes the power of a portion of a backscatter signal. The goal of the present study was to investigate how bone mineral density (BMD) and the microstructure of human cancellous bone affect two apparent backscatter parameters: the apparent integrated backscatter (AIB) and the frequency slope apparent backscatter (FSAB). Ultrasonic measurements were performed with a 3.5 MHz broadband transducer on 54 specimens of human cancellous bone. Microstructural parameters and BMD were measured using x-ray micro-computed tomography. Relationships between AIB and FSAB and microstructural parameters were analyzed using univariate correlations, partial correlations, and stepwise linear regression.

1:45-2:00 pm *Ultrasonic Backscatter Difference Measurements of Cancellous Bone at 1MHz*

Phoebe Sharp, Evan Main, and Ann Viano, Department of Physics

Faculty Sponsor: Brent Hoffmeister, Department of Physics

Background: Ultrasonic backscatter techniques are being developed to detect changes in bone caused by osteoporosis. Backscatter signals can be analyzed in either the time domain or the frequency domain. Goal: Perform time domain and frequency domain analyses of backscatter signals from bone acquired using a 1 MHz transducer. Methods: A 1 MHz transducer was used to acquire backscatter signals from 53 cube-shaped specimens of human cancellous bone prepared from the proximal end of 14 human femurs. The signals were analyzed to determine a time domain parameter called the backscatter amplitude decay constant (BADC) and a frequency domain parameter called the normalized mean of the backscatter difference spectrum (nMBD). Results: BADC and nMBD demonstrated similar weak to moderate correlations with bone (BADC: $0.13 \leq R \leq 0.60$; nMBD $0.13 \leq R \leq 0.65$). Conclusions: At 1 MHz, parameters based on time domain and frequency domain analyses demonstrate similar correlations with bone density. Both parameters (BADC and nMBD) may be sensitive to changes in bone caused by osteoporosis. Funding: NIH/NIAMS R15AR066900

2:00-2:15 pm *Correlation of ultrasonic backscatter difference parameters with bone density in clinical ultrasound images*

Abel Diaz and Brian Garra; Brent Hoffmeister and Ann Viano, Department of Physics

Faculty Sponsor: Brent Hoffmeister, Department of Physics

Background: The ultrasonic backscatter difference technique analyzes the power difference (in dB) between two gated regions of a backscatter signal and is being used to detect changes in bone caused by osteoporosis. The current study investigates correlations with bone density for these parameters determined from clinical ultrasound data. Methods: Ultrasonic backscatter images and signals were acquired from the hip and two vertebral bodies of human subjects using a 2.5 MHz phased-array transducer. Four backscatter parameters- normalized mean, slope, intercept and backscatter amplitude ratio of the backscatter difference (nMBD, nSBD, and nIBD, respectively) were determined from the power difference between two gated regions of the signal. All four parameters were analyzed for 25 different gate choices X-ray bone mineral density data for each subject were acquired for the three anatomical regions. Results: Significant linear correlations ($p < 0.05$) were found for all four ultrasonic parameters for at least one choice of gate parameters. R values ranged from 0.38 to 0.63. Conclusions: For the first time, backscatter difference parameters measured in vivo have been shown to correlate with bone density. The correlation may depend on the gated regions of the backscatter signal chosen for analysis.

The Physical World II

2:30-3:00 pm

FJ-C

Moderator: Abel Diaz

2:30-2:45 pm *Examining Ultra Luminous Infrared Galaxies with Integral Field Spectroscopy*

Eleanor Hook and David Rupke, Department of Physics

Faculty Sponsor: David Rupke, Department of Physics

Integral Field Spectroscopy is an astronomical technique that allows for the collection of individual spectra across a field of view. Effectively, this means that extended objects need not be treated as point sources when examined using spectroscopy. This research focuses on Ultra Luminous Infrared Galaxies (ULIRGs), a class of galaxies undergoing collisions, using data collected from the VIMOS instrument on ESO's Very Large Telescope. These galaxies are of interest because they are common at high redshift (that is, early in the universe's history) and are typically characterized by high star formation and black hole accretion rates. To study these galaxies, it is necessary to use a series of data reduction software to eliminate or reduce various artifacts in the data due to the atmosphere, telescope, and instrument. This research focuses on improving and expanding upon the data reduction process used for this project.

2:45-3:00 pm *Electrostatics of two charged spheres at small separation*

Yi Song, Blake Wilkerson, and Shubho Banerjee, Department of Physics

Faculty Sponsor: Shubho Banerjee, Department of Physics

There are many examples of electrostatic phenomena in our daily lives, from those as simple as the sparks that accompany the taking off of our sweaters, to the formation of clouds and rain

droplets. Moreover, electrostatics are widely used in modern industry, such as laser printing and automotive spray painting. Our research project focuses on analyzing the electrostatic interaction between two charged conducting spheres in the limit when they are about to touch each other. By using analytical techniques, we obtain dimensionless expressions of capacitances for those two spheres. Furthermore, we derive the electrostatic force between two spheres. When the two spheres are of the same size, our results show that the electrostatic force can be expressed as a linear combination of two parts, one is always attractive and the other one is always repulsive. The attractive part always dominates the repulsive part at sufficiently small distances, thus the electrostatic force is always attractive at small distances, even for positively charged spheres!

HUMANITIES ORAL SESSIONS

Rhodes Historical Review

11:00 am - 12:30 pm

Buckman 200

Moderator: Seok-Won Lee, Department of History

11:00-11:25 am *The Myth of Nixon's Opening of China*

Nicholas DeMaris

Faculty Sponsor: Seok-Won Lee, Department of History

On February 21, 1972 the international political environment was forever changed when President Richard Nixon arrived in Beijing in the first public display of diplomatic relations between communist China and the United States since the end of the Chinese Civil War in 1950. However, the significance of Nixon's actions in the opening of China has been systematically mischaracterized within the historical conversation at large. This presentation seeks to reevaluate the traditional historical narrative by placing Nixon's willingness to engage with a revolutionary communist regime within the broader context of the evolving nature of post-War bipolarity, US containment policy, and the perpetual impetus to project American influence globally. In reconsidering these actions, the opening of China can now be viewed in a different light; one that does not represent a complete break with United States foreign policy during the Cold War.

11:25-11:50 am *The Creation of Meaning in Fascist Italy: History and Myth in Urban Reconstruction and Public Cartography*

Bonnie Whitehouse

Faculty Sponsor: Seok-Won Lee, Department of History

By appropriating Roman visual language and reorganizing both public spaces and written history to fabricate a lineage between Imperial Rome and Fascist Italy, Mussolini intentionally created, limited, and communicated meaning between his Fascist regime and citizens of Rome. His power over the creation of meaning stemmed not only from his absolute authority as a dictator, but also from his belief in the power of mass faith to create truth and by pervious episodes of

Italian history; namely the Unification, Risorgimento, and post-WWI periods. In this study, the literary reception theory of Wolfgang Iser is used to better understand how meaning is transmitted from an author to reader, or in the case of a historical moment from a ruler to citizens. While the manifestations of Fascist communication in public spaces, written history, and public cartography may be largely disregarded by the literature, an understanding of their intended and realized function as well as the contextualization of Mussolini's actions with a theory of communication can add depth and artistry to the discussion of propaganda in Fascist Italy and clarify the reception of Rome as a city and of Fascism by Italian citizens.

11:50 am – 12:15 pm *The Unspoken Demands of Slavery: The Exploitation of Female Slaves in the Memphis Slave Trade*

Sarah Eiland

Faculty Sponsor: Timothy Huebner, Department of History

In the antebellum South, exploitation and mistreatment characterized the plight of the female slave. In Memphis, the story remained unchanged. The abusive and exploitative nature of the Memphis slave trade emerges through high prices for particular female slaves, the growth of the mulatto population, and the existence of mulatto children from certain prominent local figures. The survival of slavery depended upon the ability of the domestic slave population to sustain itself through the female slave population. This view of bondswomen as natural breeders and the accessibility of enslaved females in an urban setting, subjected them to sexual violence and exploitation. Higher average prices for young female slaves capable of having children, and higher prices for women with conventionally attractive qualities show that the price paid for a bondswoman can be used to infer the motives for buying her. Also, in Memphis between 1850 and 1860, in the most populous ward of the city, the percent of the population considered Mulatto rose by 27%. A rise in the population of slaves of mixed race is the physical evidence of sexual relations occurring between slave women and the white men who owned them.

Cultural Encounters

1:30-2:15 pm

Palmer 207

Moderator: Junior Walters

1:30-1:45 pm *The Marvelous Other: The Travelogue of Muhammad as-Saffar*

Junior Walters

Faculty Sponsor: Ety Terem, Department of History

The Marvelous Other is a study of the travelogue of Muhammad as-Saffar, a Moroccan scholar, notary, and jurist who journeyed to France in 1845. The paper investigates the observations as-Saffar, who perceived his journey as an educational one, made on French society at the request of the Sultan 'Abd al-Rahman. The Moroccan scholar perceived a strong society, whose strength was rooted not only in the chambers of the Parlement français or in the theatrical military

demonstrations he witnessed, but also in cultural institutions. In branches of state, he saw strength in military and political organization, as well as the sophistication of and respect for the legal system; at the civil level, an emphasis on education and critical thinking, as well as the use of leisure as an instrument toward productivity. In as-Saffar's travelogue, readers are given a glimpse into one man's encounter with modernity, of great value to understanding the outlook of Moroccans at the genesis of a new era of interaction with a powerful and remarkable "other," long before this interaction turned to oppression.

1:45-2:00 pm *Islam's Impact on African American Music*

Shehla Yousuf

Faculty Sponsor: Vanessa Rogers, Department of Music

Enslaved Africans were often Muslim, as seen from the Muslim names in ledgers of slave owners, runaway slave advertisements, and records of Islamic activity among enslaved peoples. However, the practice of Islam seemed to falter as the enslaved people were increasingly Christianized by slave owners. Islam came back into the picture for African Americans during the Civil Rights Movement, when identifying as Muslim gave many African Americans a way to adopt another identity besides black, which allowed them a higher status in society. Islam provided an outlet for civil rights and black power, and in turned shaped the way different traditionally African American music forms, such as jazz and hip hop, were formed.

The Life of the Text

2:30-3:15 pm

Palmer 210

Moderator: Lin Zheng

2:30-2:45 pm *The Aeneid on Its Own Terms*

Lin Zheng

Faculty Sponsor: Joe Jansen, Department of Greek & Roman Studies

Traditionally, scholars have read the Aeneid as a piece of propaganda for the Augustan empire. But in his *Two Voices of the Aeneid*, Parry, rejecting the historicist reading, brings attention to elements critical of the said empire, which decisively divided the interpreters into the "Harvard School['s]" pessimistic readings and those who maintain the traditional "optimistic readings" (Kallendorf). Some recent scholars have tried to seek unity between these two readings by adopting thesis similar to Parry's reading (Schmidt), which interprets the Aeneid as an artistic expression with humanistic sympathies (Parry). But their prioritization of instances of textual analysis, like the historicist they criticize, also allows isolated themes to overshadow the structural context in which each scene occurs, thus segmenting Virgil's narrative as a unified whole. In an attempt to reveal this unity, this paper prioritizes the sequence of events in interpreting the symbols within the scenes analyzed by Parry and the significance of these scenes

to the whole. The paper offers a third perspective that reconstructs the idealistic social-political narrative presented in the Aeneid on its own terms.

2:45-3:00 pm *Social Class as Portrayed in Ancient Sumerian Debate Poetry*

Noah Mesa

Faculty Sponsor: Michael Flexsenhar, Department of Religious Studies

The ancient Sumerian poem, the Debate between Winter and Summer, depicts a quarrel between the two seasons personified as brothers Winter and Summer. Each argues for his superiority. Unlike the other known debate poems from ancient Sumer, the secondary participant Summer does not offer a rebuttal to Winter's final argument. Instead he flattered the arbiter of the debate, the god Enlil. This paper utilizes thematic analysis to demonstrate how this dispute reinforces social class hierarchies in ancient Sumer. The poem portrays Summer as a common laborer who utilizes the lordly Winter's gifts. The final reconciliation of the two brothers downplays class inequalities between them by emphasizing the importance of harmony. Due to Winter's increased lordliness compared to summer, Enlil declares that Winter as the winner. This 5,000 year old poem shows how debates which are predicated on equality and fairness can be skewed by a person's social status.

Asian Historical Studies

1:30-2:15 pm

Palmer 210

Moderator: Will Notelovitz

1:30-1:45 pm *Kang Youwei and the Modernization of China*

ZongFang Li

Faculty Sponsor: Seok-Won Lee, Department of History

Nineteenth century China was a time of turmoil. Facing both internal and external threats, Intellectuals in late nineteenth century China had their own interpretation toward the fate of China. Intellectuals were debating the most fundamental questions: what is the role of Confucianism in China's future. Western audiences in 1960s and 1970s commonly believed that Confucianism itself is an obstacle for China to modernize, since modern China eventually did not put emphasis on Confucianism and its social structures. However, Kang You wei was one of intellectuals in nineteenth century China who tried to change Qing China into a constitutional monarchy that put emphasis on Confucianism institution. This URCAS presentation tries to show Kang You wei's effort of preserving Chinese tradition and maintaining Confucian institution, by analyzing Kang's primary sources. Therefore, this president hopes to give a clearer picture to the audiences about China's struggle in modernization and major factors in its failures of preserving Confucian institutions.

1:45-2:00 pm *The Case for Taiwan*

Will Notelovitz

Faculty Sponsor: Seok-Won Lee, Department of History

This presentation looks into the formal international standing of the Republic of China and makes the argument for Taiwanese Independence. The territorial disputes between the People's Republic of China and the Republic of China have left the Republic of China isolated from the international community. The goal of this paper is to articulate that the Republic of China must rescind its claims of being China, and rather be internationally recognized as Taiwan. Although this decision will cause drastic shifts in the Geopolitics of the Region, along the threat of invasion, it is imperative for the future of Taiwan.

Spanish Senior Seminar I

2:15-3:15 pm

Language Center

Moderator: Clara Pascual-Argente, Department of Modern Languages & Literatures

2:15-2:30 pm *Formal Ideology in Film Propaganda about the Spanish Civil War (1936-45)*

Barry Rich

Faculty Sponsor: Clara Pascual-Argente, Department of Modern Languages & Literatures

The Spanish Civil War saw a marked growth in the production of war propaganda, in particular in cinematic form. The republicanos, nacionales, and their respective allies produced hundreds of films in order to rally support both within Spain and internationally. After the war, the fascist regimes of Spain, Italy, and Germany continued to produce propaganda about the civil war to enforce their version of the conflict. Current scholarship on these films (which had focused on fascist production from Spain) tends to concentrate on their ideology without accounting for their cinematic features, and therefore our understanding of these works remains incomplete. In this paper, I will study the interplay between form and ideology in six propaganda films from 1936 to 1945, representative of the different national origins and genres of the available body of works: *Nosotros somos así!* (1937), *Blockade* (1938), *The Spanish Earth* (1938), *Romancero marroquí* (1939), *Sin novedad en el Alcázar* (1940), and *Raza* (1942). In addition to analyzing the formal characteristics of these films and how they relate to their propagandistic aims, I will consider whether they are shared across ideological lines.

2:30-2:45 pm *Representing the Female Body in Tomás Eloy Martínez's Santa Evita*

Camille Hudson

Faculty Sponsor: Clara Pascual-Argente, Department of Modern Languages & Literatures

Santa Evita, written in 1995 by Tomás Eloy Martínez, recounts the story of Eva Perón, the noted First Lady of Argentina from 1946 to 1952. The novel touches on many moments of Evita's life, from her childhood to her death, paying special attention to the fate of her embalmed body, which became a symbol of her husband's regime. This paper will focus on Martínez's

representation of Evita's female body as it is shaped and itself shapes Argentina's patriarchal society. First, I will use Freud's Theory of Fetishism to examine the obsession with Evita's body by male characters such as Moori Koenig and Pedro Ara, the head of the Argentine Military Intelligence and Evita's embalmer, respectively. Second, I will analyze Martínez's portrayal of the roles Evita plays during her lifetime as daughter, wife, and mother. Understanding how Martínez depicts Evita will provide a greater insight as to why she is still relevant in today's society.

2:45-3:00 pm *Post-war Spanish Poetry: the construction of memory in relation to Spain's political landscape*

Katie Kuhn

Faculty Sponsor: Clara Pascual-Argente, Department of Modern Languages & Literatures

In spite of the turbulent historical context of the Spanish Civil War and beginning of the Franco regime, the poetry produced in Spain in the 1940s was prolific and revolutionary. Two of the most important works in this decade were Dámaso Alonso's *Hijos de la ira* (1944) and Luis Rosales's *La casa encendida* (1949), written by poets with a close personal relationship, but who were also on opposite ends of the political spectrum. *Hijos de la ira* is harsh, direct, and coarse, offering a clear critique of the violence and destruction happening both in Spain and the rest of the world, while *La casa encendida* is much subtler, focusing on personal topics and taking on an almost narrative structure with everyday language. Given the formalist bent of scholarship on Spanish poetry—especially on the poetry of this era—the aesthetic differences have meant that the two works have not been studied in relation to one another. In this presentation, I approach them in relation to the political and social atmosphere, considering the different ways in which each treats the topic of memory, in order to ultimately contend that Rosales's work can be understood as a response to Alonso's.

3:00-3:15 pm *Orientalism in don Juan Manuel's El conde Lucanor*

Lacey Ballard

Faculty Sponsor: Clara Pascual-Argente, Department of Modern Languages & Literatures

Edward W. Said's conceptualization and critique of orientalism, the study of Eastern people and culture by the West, is specifically aimed at the study of the Muslim world by the French and the British in the 19th and 20th centuries. However, over the past few decades scholars have explored the potential usefulness of this concept in the study of medieval literature and culture, particularly in relation to epics with Christian and Muslim characters. In this presentation, I consider the concept of orientalism in relation to the fourteenth-century frame-tale collection *El conde Lucanor*, by don Juan Manuel, in which we can read not only stories of war and collaborative interactions between Christians and Muslims, as we do in epics, but also tales entirely set in the Muslim world. By examining the representation of Muslims in the work; its appropriation of Islamic cultural forms; and its use of specifically Iberian cultural forms that were common to both Muslims and Christians, I will show how the concept of orientalism may

be useful to the study of *El conde Lucanor* and where it reaches its limits for the study of medieval Iberian culture.

Spanish Senior Seminar II

3:30-4:30 pm

Language Center

Moderator: Clara Pascual-Argente, Department of Modern Languages & Literatures

3:30-3:45 pm *Finding fact in fiction: Subjective truth and collective memory in El espíritu de la colmena and El Señor Presidente*

Sarah Morris

Faculty Sponsor: Clara Pascual-Argente, Department of Modern Languages & Literatures

Scholarship on the formation of post-dictatorial collective memory has highlighted the essential role of testimony (first-person narratives about personal experience), both as a way to counter the “official history” of the period and as a complement to a more objective but often detached presentation of historical facts. Here I contend that works of historical fiction contribute to collective memory in a manner similar to testimony, as they emphasize both subjective emotion and human experience. Two such works of historical fiction which elevate the role of subjective experience over diachronic truth are *El espíritu de la colmena*, the 1973 film by Víctor Erice depicting life in Spain under the dictatorship of Francisco Franco, and *El Señor Presidente*, the 1946 novel by Miguel Ángel Asturias that describes the regime of Guatemalan dictator Miguel Estrada Cabrera. Though working in different artistic genres and geo-political contexts, both works share a number of techniques that allow them to offer a codified but candid portrayal of life in a dictatorial regime. In this paper, I will examine the network of intertextual references and fictionalization of reality present in both works, which, as I will argue, constitute a central component of a subjectively inflected collective memory of dictatorship.

3:45-4:00 pm *Englishes, Spanishes y Más: Expanding the Critical Framework of “Bilingual” Latino Poetry*

Savannah Patton

Faculty Sponsor: Clara Pascual-Argente, Department of Modern Languages & Literatures

Bilingualism in Latino poetry was initially viewed through a deficit lens, in which switching back and forth between languages was regarded as the result of insufficient language abilities. More recent scholarship has instead approached bilingual Latino poetry through a socio-linguistic lens, revealing “code-switching” to be a literary tactic allowing bilingual writers to more fully express their identities and experiences, which both traverse and inhabit linguistic, cultural, and ethnic boundaries. Thus the idea of linguistic and cultural “in-betweenness” has often been used to describe the experience of being “stuck between two worlds,” a common theme in Latino poetry. But are such binaristic categorizations—of bilingual, of being caught between two worlds—an oversimplification of a much more complex, multilingual and

multicultural reality? In this presentation, I will argue that these binaristic frameworks often prove insufficient to articulate the nuanced and multi-faceted nature of many Latino American experiences with language. The analysis of a representative corpus of Latino poetry (some written mostly in Spanish, some written mostly in English, and some defying strict, either-or categorization) focused on linguistic matters will allow me to propose a critical framework of multilingualism—a framework whose borders are permeable, unfixed, and wide enough to engage the diversity of Englishes, Spanishes, both y más that characterize Latino poetry.

4:00-4:15 pm *Responsibility and Control: Lamenting a Go-Between's Loss in the Book of Good Love*

Megan Aleman

Faculty Sponsor: Clara Pascual-Argente, Department of Modern Languages & Literatures

The ambiguity of the *Book of Good Love* (*Libro de buen amor*) by Juan Ruiz has confounded readers and scholars since its first circulation in the fourteenth century. This masterpiece of medieval Spanish poetry probes the complex relationships between desire, sin, death, and interpretations of love through the sexual liaisons, didactic lessons, and heartfelt prayers of its narrator and main character, the Archpriest of Hita. In this paper, I propose the reading of the Archpriest's lament for the death of his procuress, Trotaconventos, as the culmination of the work. The lament deviates from traditional models in both its tone and apparent lack of resolution; these features are directly related, as I will argue, to the main character's avoidance of moral responsibility for his actions. This approach offers an additional interpretation of the passage, which is supplemented by the scholarly analysis of the lament as a parody. By examining the lament in conjunction with these considerations, the Archpriest's placement of Trotaconventos in heaven can be understood as an attempt to provide a resolution for both the lament and the text as a whole.

4:15-4:30 pm *Genre, Language, and Power in Rigoberta Menchú and Gloria Anzaldúa's Works*
Matt McKeand

Faculty Sponsor: Clara Pascual-Argente, Department of Modern Languages & Literatures

Me llamo Rigoberta Menchú y así me nació la conciencia by Elizabeth Burgos and *Borderlands/La frontera: The New Mestiza* by Gloria Anzaldúa discuss the difficulties of being part of a linguistic minority, particularly in response to the attempts of language control by the majority culture. Because they belong to very different geographical and socio-political contexts as well as genres (testimony and autobiography), these works have not yet been studied alongside one another. However, they are arguable the two most relevant examples for a study of the ways in which literary genre intertwines with the representation of, and resistance to, linguistic oppression. In this presentation, I will look at how the experience of being an oppressed linguistic minority is shaped in testimony and autobiography, and, more importantly, at how the two genres may or may not serve as tools in reclaiming political and linguistic self-governance.

Regional Histories

3:30-4:30 pm

Palmer 210

Moderator: Shehla Yousuf

3:30-4:00 pm *When D.C. Came to the Delta: A Documentary* ■

Junior Walters

Faculty Sponsor: Charles McKinney, Department of History

When D.C. Came to the Delta is a 23-minute documentary film produced through the Rhodes Institute for Regional Studies that examines Sen. Robert F. Kennedy's trip to the Mississippi Delta in April 1967 and how the region has developed in fifty years. Over the course of four days, activist Marian Wright led Kennedy through Delta communities to reveal the human toll of American poverty and hunger. Followed by a host of other politicians and journalists, when Kennedy came to the Delta, he brought with him the eyes of Washington and the nation, lifting the veil on how far white elites would go to preserve the segregationist status quo in Mississippi. Placing the 1967 tour within the historical and political context of the rural South, the documentary traces a narrative of racial subjugation from the mid-twentieth century to today. Development organizations in the Delta today focus on expanding equal educational opportunities and access to healthcare, fighting the political and economic legacy of poverty wrought by segregation.

4:00-4:15 pm *Transgender Employment Discrimination: A Memphis Perspective* ■

Benjamin Rosenberg

Faculty Sponsor: Natalie Person, Department of Psychology

Gender discrimination is rampant and persistent in the United States. Surveys from all over the country report wide-spread gender discrimination, and the transgender community feels the effect through lower wages and economic insecurity. Rates of poverty, unemployment, and underemployment are all significantly higher for the transgender community than for the rest of the U.S. adult population (James & Harman 2017). In many states, there is also a lack of protection against gender discrimination, which leaves the transgender community without legal resources to fight discrimination. But the workplace can help alleviate that problem. They can provide workplace anti-discrimination policies, as well as stop harassment and discrimination within their own company. The lack of legal protection for the transgender community allows gender discrimination in employment to be a rampant problem, and the workplace can be a powerful agent of change in regards to transgender employment and poverty rates, as well as how transgender people are treated by others. I researched the extent of employment discrimination against the transgender community in Memphis by conducting interviews with affected community members, as well as researched relevant Tennessee laws that impact the community.

POSTER SESSION I

Multi-Sports Forum in the Bryan Campus Life Center

11:30 am – 1:30 pm

Poster numbers are listed with each title.

St. Jude Summer Plus Fellowships

#1 *The Effects of Mitochondrial Mutation of Tumorigenesis* ■

Danielle Healey and Xiujie Li Harms, St. Jude Children's Research Hospital, Department of Pathology

Faculty Sponsor: William Eckenhoff, Department of Chemistry

This paper investigated the activity of tumorigenesis within mitochondrially mutated progenitor cells. It seeks to answer how the epigenetics of mitochondrially mutated cells containing the N-Myc oncogene changes the rate of tumorigenesis. The experiment investigated the changes in methylation and acetylation of the N-Myc infected progenitor cells to determine the extent that gene expression and regulation were occurring at. It focused on the differences in acetylation and methylation regarding the different genotypes in the PolG mice model (wild type, heterozygous, homozygous) containing the N-Myc gene. Immunofluorescent imaging was used to quantify the changes in acetylation and methylation of the cells and establish the degree of change in the epigenetics compared to how the cells experienced changes in tumorigenesis. Preliminary results indicated decreased tumorigenesis in the homozygous N-Myc progenitor cells compared to the wild type and heterozygous models infected with N-Myc. Studies to determine the degree of change in acetylation and methylation between genotypes are ongoing.

#2 *Identifying Ubr4 substrates and regulators of muscle growth* ■

Jared Stover and Liam Hunt, St. Jude Children's Research Hospital, Department of Developmental Neurobiology

Faculty Sponsor: Bayly Wheeler, Department of Biology

Protein homeostasis, or proteostasis, involves regulation and coordination of protein synthesis and degradation. The Ubiquitin-proteasome pathway is a principal protein degradation pathway and key to maintaining skeletal muscle proteostasis during growth and aging. Ubr4, a member of the Ubr ubiquitin ligase family, was previously identified as a conserved muscle growth regulator across multiple model systems. Loss of Ubr4 produces muscle hypertrophy, and by proteomic analysis resulted in elevated levels of several proteins, suggesting Ubr4 may target these proteins for degradation and they may play a role in regulating muscle growth. Here we tested whether the proteins identified by proteomic analysis are direct substrates of Ubr4 by co-immunoprecipitation experiments. The proteins Ube2b, Hat1, Rbbp4 and Rbbp7 were shown to interact with UBR4 and required Ubr4 for ubiquitination. Tissue specific UBR4 silencing leads to increased growth of the eyes and muscle in *Drosophila Melanogaster*. Epistatic analysis in the eyes confirmed that several proteins regulated by UBR4, including HAT1 and PCNA, were

necessary for this loss of UBR4 dependent growth phenotype. Silencing of HAT1 and PCNA also inhibited muscle growth. Loss of HAT1 in combination with loss of UBR4 in muscle prevented hypertrophic growth, indicating that increased HAT1 is necessary following loss of UBR4 for hypertrophy. This study establishes direct substrates of Ubr4, which emerge as novel regulators of muscle growth.

#3 *Implementing standardized patient handoff procedures for interdepartmental transports between inpatient and OR* ■

Ellie Sommerkamp, Jonathan Burlison and James Hoffman

Faculty Sponsor: Alan Jaslow, Department of Biology

One of the most vulnerable areas patient care is during patient handoffs and transfers, and The Joint Commission reported that communication failures are the leading contributing factor in medical errors that result in severe harm. Standardizing handoff communication formats can reduce errors and patient harm. The use of one mnemonic handoff system, IPASS, has demonstrated a 30% reduction in preventable patient harm and emerged as a best practice. This quality improvement project adapted the IPASS for patient transfers between the operational room (OR) and inpatient care units. Project leaders have collaborated with OR staff to successfully revise the method in respect to the details of inpatient to OR handoffs. Sustainment of IPASS use will be enforced by OR project collaborators conducting direct observations of their peers delivering handoffs and provide immediate feedback of handoff performance. Using a validated data collection tool, staff will document observed handoff performances and these data will inform continuous improvement efforts. Development of IPASS for OR to inpatient unit handoffs is nearing completion, and data from other interdepartmental handoffs that have been using IPASS will be analyzed to visualize how IPASS data will be similar for this new setting.

#4 *Observing Patterns of Antibiotic Resistance in Pneumonia* ■

Erin Dindoruk, Rhodes College; Jason Rosch, Department of Infectious Diseases, St. Jude Children's Research Hospital; Haley Echlin, Department of Infectious Diseases, St. Jude Children's Research Hospital

Faculty Sponsor: Dhammika Muesse, Department of Chemistry

Pneumonia is one of the most common bacteria that infect humans. Over the years pneumonia has gained resistance to many commonly used antibiotics. The goal of this experiment is to observe the rate of resistance of pneumonia for several different antibiotics: Bactrim, Rifampacin, and Trimethoprim. The experiment involved exposing 4 different strains of bacteria to blood-agar plates mixed with the antibiotics. The colonies of bacteria were individually counted on each plate. Plates with a greater number of colonies indicated greater resistance. The strains included T4, a wild type strain, Δ HexA, a mutant with a higher frequency of mutation, Δ ComeC, a mutant with a lower frequency of mutation, and a hybrid of Δ HexA and Δ ComeC. It was predicted that the Δ HexA would have the greatest number of colonies, and Δ ComeC would have had the smallest. For Rifampacin this appeared to be the case. For Bactrim, however, T4

shows the highest resistance over all the other strains. According to our results, Bactrim is a less effective antibiotic than Rifampacin.

#5 Targeting histone demethylase KDM6B for treatment of neuroblastoma ■

Anoushka Mullasseril, Rhodes College; Tara Rakiewicz, Drexel University; Jun Yang, Department of Surgery, St. Jude Children's Research Hospital

Faculty Sponsor: Kimberly Brien, Department of Chemistry

Neuroblastoma is a cancer of the sympathetic neuron system that accounts for 15% of all childhood cancer-related deaths, an unusually high proportion based on the fact that it accounts for 7% of childhood malignancies. The survival rate for high-risk neuroblastoma is only 40% with current treatments including chemotherapy and radiation which cause unwanted side effects. There is growing interest to develop novel therapies by targeting epigenetic factors. KDM6B, a histone demethylase also known as JMJD3, is known to play a role in various types of cancer such as NOTCH1-mediated T-cell acute lymphoblastic leukemia. However, the role of KDM6B in neuroblastoma is largely unknown. Our previous studies indicate that KDM6B may serve as a new therapeutic target in neuroblastoma. We therefore hypothesize that pharmacologically targeting KDM6B could prove to be therapeutic in the treatment of neuroblastoma. To better understand the role of KDM6B, we utilized siRNA transfection and shRNA to inhibit KDM6B expression. We further tested a drug called GSK-J4 which targets the KDM6B protein. These studies have shown that genetic or pharmacologic inhibition of KDM6B could be a promising treatment for neuroblastoma, but more research is needed to understand the pathways involved.

#6 Constituents of *Brunfelsia Grandiflora* Against Pediatric Malignancies ■

Rachel Bassett, Rhodes College; Fatima Rivas, Department of Chemical Biology and Therapeutics, St. Jude Children's Research Hospital; TaoTao Ling, Department of Chemical Biology and Therapeutics, St. Jude Children's Research Hospital.

Faculty Sponsor: Mauricio Cafiero, Department of Chemistry

Leukemia is the most common pediatric cancer with 75% of these cases being acute lymphoblastic leukemia (ALL). While the pediatric ALL survival rate is high (~90%), relapses still occur following treatment in about 20% of patients, which at this state their prognosis is poor. Relapse usually includes a cell phenotype that is resistant to drug treatments. Particularly, relapse ALL in many patients exemplify up-regulated resistance to glucocorticoids, a widely utilized drug treatment. Natural products are known to have many secondary metabolites that can serve as therapeutic agents. Primary cytotoxic assays of various natural products were screened against a focused cellular cancer panel. Following dose response assays against sensitive and resistant B-cell ALL models, *Brunfelsia grandiflora* was identified. Now, our studies are focused on identifying potential hits against ALL cell lines and determining the bioactivity of the fractions of *Brunfelsia grandiflora*. Cell viability was determined using the proliferation assay CellTiter-Glo. Here, we describe our promising findings and highlight one of the natural

products' extract fraction, found in *Brunfelsia grandiflora*. Ongoing studies are focused on structure elucidation and characterization of promising compounds in the natural product fractionations. Further, mechanistic mode of action studies of the chemical composition of *Brunfelsia grandiflora* will be reported in due time.

#7 *YBX1* Regulates Cell Proliferation in Developing Neural Tubes ■

Luis Milburn and Jennifer Loome, Rhodes College; Myron Evans, St. Jude Children's Research Hospital, Department of Developmental Neurobiology; Jamy Peng, St. Jude Children's Research Hospital, Department of Developmental Neurobiology

Faculty Sponsor: Jamy Peng, St. Jude Children's Research Hospital, Department of Developmental Neurobiology

Cell proliferation in the developing neural tube is essential to the development of the nervous system. The balance of stem cell proliferation and differentiation requires the coordination of molecular processes including epigenetic mechanisms, which regulate gene expression profiles. One epigenetic mechanism involves the PRC2 complex, a histone methylase that has been shown to play a role in cellular differentiation, perpetuation of cellular identity, proliferation, and stem cell plasticity. Our studies of the PRC2 complex led to the identification of a new PRC2-binding protein called YBX1, which is a proliferation regulatory factor highly expressed in the brain. Quantification of cell division in the neural tubes of mice using immunofluorescent sections of both *Ybx1* +/- and *Ybx1* -/- shows that *Ybx1* knockout results in increased cell division. A separate experiment using fluorescence activated cell sorting (FACS) confirmed our findings from immunofluorescence quantification. Altogether, our findings suggest that YBX1 modulates cell proliferation in the developing neural tube.

#8 *Granule neuron differentiation status and substrate modulate the Netrin-1 signaling response in the cerebellum* ■

Lelo Shamambo, Rhodes College; Christophe Laumonnerie, Developmental Neurobiology, St. Jude Children's Research Hospital; David Solecki, Developmental Neurobiology, St. Jude Children's Research Hospital

Faculty Sponsor: Kelly Dougherty, Department of Biology

During development, granule neuron progenitors often have to migrate over long distances from their germinal zone to their final location. They navigate by integrating chemorepulsive or chemoattractive guidance cues, which sometimes come from the germinal zone through guidance molecules. However, it is unclear how neurons, upon differentiation, modulate their response to a given signal. In this study, we focus on the guidance-signaling protein Netrin-1 (*Ntn1*) and its role in mouse cerebellar development. Using FACS sorting to isolate the granule neurons of *Atoh1*-GFP transgenic mice cerebella based on their differentiation status, we ran an in vitro gradient assay to track the netrin-driven migration patterns of different stages of granule neurons based on their GFP fluorescence on two substrates: laminin and vitronectin. We show that

granule neurons display different migration behaviors in response to Ntn1 depending on their differentiation status and the surrounding substrate.

Biology 141

#9 *Does Competition for Food Increase Aggression in Crickets?*

Gretta Hotz, Joshua Alexander, and Audrey Simpson

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#10 *The Effects of Varying NaCl Concentrations on Duckweed Growth*

Meredith Bacue, Hannah Cantwell, Josh Hill, and Tran Hoang-Viet

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#11 *Effects of Sex on Aggressive Behavior in a Reflective Environment*

Tristan Brunet, Jackie Jiang, Veronica Pehlivanov, and Cassidy Pham

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#12 *The Effect of Different Strengths of Light on Cricket Activity*

Samantha Feinstein, Kunyuan Li, Sofia Karabell, and Isabelle Lam

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#13 *The Effects of Light Exposure on Lichen Density*

Kendall Gasner, Aspen Robinson, and Taissia Smirnova

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#14 *The Effect of Light on Cricket Feeding Behavior*

Keerthana Kasetty, Ashley Mullarkey, and Ethan Houley

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#15 *Effects on Stomatal Aperture Diameter Depending on Amount of Light Exposure in C3 plants*

Chrysanne Bennet, Marissa Bobay, Shaliz Barzani, and Aryan Galani

Faculty Sponsor: David Kabelik, Department of Biology

#16 *The effect of vehicular pollution on lichen distribution*

Leda St. Cyr, Pavan Ramachandria, and Brianna Betton

Faculty Sponsor: David Kabelik, Department of Biology

#17 *What will be the effect of the number of times cricket's chirp if temperature is manipulated in the environment?*

Cody Cheney, Margaret Larsen, Adam Martinez, and Deja Walls

Faculty Sponsor: David Kabelik, Department of Biology

#18 *How Will Different Wavelengths of Light Affect the Growth of Terrestrial and Aquatic Plants?*

Helen Files, Kristin Reed, and Mitchell Batschelett

Faculty Sponsor: David Kabelik, Department of Biology

#19 *How does sex affect behavior between two crayfish?*

Lauren Benfield, Caroline Roof, Athena Tiwari, and Grace Tolan

Faculty Sponsor: David Kabelik, Department of Biology

#20 *Control of environmental pH and its effects on duckweed leaf growth*

Meghan Hansen, Elizabeth Vernon, and Kate Petrinjak

Faculty Sponsor: David Kabelik, Department of Biology

#21 *Effects of sunlight on lichen growth on rough-bark trees*

Zoe Brookover, Lyba Naseer, and Frank Pellegrino

Faculty Sponsor: Stephanie Haddad, Department of Biology

#22 *House cricket food preference: protein or sugar?*

Vincent Bovino, Andrew Liess, and Darius Swift

Faculty Sponsor: Stephanie Haddad

#23 *The effect of air pollution on the prevalence of lichen growth on trees in Overton Park*

Luis Sanchez, Zoe Scott, Kayla Puzdrakiewicz, and Morgan Thomasson

Faculty Sponsor: Stephanie Haddad, Department of Biology

#24 *The evaluation of Acheta domesticus hiding preference*

Michael Geddati, Ameley Lawson, and Brandon Waddell

Faculty Sponsor: Stephanie Haddad, Department of Biology

#25 *The effect of ethanol and caffeine on crayfish aggression*

Kathleen Bochow, Amanda Cheang, Maryella Cohn, and Grace Tomeny

Faculty Sponsor: Stephanie Haddad, Department of Biology

#26 *The effects of NaCl concentration on freshwater duckweed leaf growth*

Hannah Elliott, Coby Grubbs, Stewart Nichols, and Ben Vickers

Faculty Sponsor: Stephanie Haddad, Department of Biology

#27 *Comparing Lichen Growth on Trees Near a Well-Traveled Road to Lichen Growth on Trees in a Park*

Caroline Blevins, Isaiah Pratt, Niharika Tayade, and Shaun Wang

Faculty Sponsor: David Pike, Department of Biology

#28 *The effect of light color on the growth and survival of Wisconsin fast plants (Brassica rapa)*

Layth Al-Hindi, Emily Sanders, Arnav Thakur, and Mitch Weatherford

Faculty Sponsor: David Pike, Department of Biology

#29 *How do plants minimize water loss? Impact of time of day on stomatal aperture*

Fatimata Deme, Patrick Rees, and Chris Schulze

Faculty Sponsor: David Pike, Department of Biology

#30 *Do Crickets Prefer High-Carb Diet or High-Protein Diet?*

Angel Harris, Joe Hernandez, Lia Nagge, and Elizabeth Tucker

Faculty Sponsor: David Pike, Department of Biology

#31 *Crayfish Aggression in Response to Construction Noise vs. River Noise*

Meredith Schoel, Grayson Burke, Emma Collier, and Starr Milbury

Faculty Sponsor: David Pike, Department of Biology

Sciences

#32 *Identification of Chitin Synthases Required for Cytokinesis in the Filamentous Fungus*

Aspergillus nidulans

Spencer Beckman, Lauren Rowland, Zoe Brookover, Rachel Ward, and Loretta Jackson-Hayes, Department of Chemistry

Faculty Sponsor: Terry Hill, Department of Biology

Cytokinesis is extremely important for hyphal growth in filamentous fungi. This involves formation of cross-walls called septa, which provide structural reinforcement and help compartmentalize the fungal cells. Chitin synthases are transmembrane proteins that synthesize chitin, which is a main component of septa. In *Saccharomyces cerevisiae*, there are two chitin synthases that are involved in septation: Chs2 and Chs3. We have identified three candidate genes in *A. nidulans* (ChsC, ChsA, and CsmA) that are homologous to the chs2 and chs3 genes in *S. cerevisiae*. We hypothesized that one of these three candidates may play a similar role in *A. nidulans* to either chs2 or chs3 in *S. cerevisiae*. We tested our hypothesis through GFP tagging

and gene deletion to determine where the genes' products (proteins) carry out their function and if the genes play significant roles in septum formation. Preliminary results of deleting *chsA* and *chsC* demonstrated impaired cytokinesis. A deletion of *csmA* is currently being carried out. In addition, we observed that all three proteins localize at sites of developing septa. Our results demonstrated that ChsC, ChsA, and CsmA play roles in chitin formation for cytokinesis in *A. nidulans*.

#33 *Co-immunoprecipitation Using BimG::GFP in the Filamentous Fungus Aspergillus nidulans*
Lauren Rowland, McLean Williamson, and Loretta Jackson-Hayes, Department of Chemistry

Faculty Sponsor: Terry Hill, Department of Biology

Aspergillus nidulans is a model organism that is commonly used for research in fungal cell biology. The major process that is focused on in *A. nidulans* within our lab is cytokinesis. BimG is an essential serine/threonine phosphatase that plays an important role in cell cycle regulation as well as formation of septa. Septa are cross-walls, which provide structural reinforcement for hyphae and help compartmentalize fungal cells; septa are formed during the final steps of cytokinesis. To discover the possible binding partners of BimG, a co-immunoprecipitation assay was run. A co-immunoprecipitation assay is when antibodies bind to the protein of interest and are removed from the protein solution, so the protein of interest along with other proteins bound to it can be analyzed with protein mass spectrometry at St. Jude Children's Research Hospital. The *A. nidulans* strains used for this experiment were GFP tagged BimG and a GFP only strain. The results indicate that there were several possible binding partners (such as TubA, KapA, BenA, HexA, Cdc48, and ArtA). These results provide us with possible binding partners to study that may have other roles in cytokinesis. They also reveal that this procedure could be useful in studying other protein-protein interactions.

#34 *Elucidating the Role of Paxillin B in Septation in Aspergillus nidulans*

McLean Williamson and Loretta Jackson-Hayes, Department of Chemistry

Faculty Sponsor: Terry Hill, Department of Biology

Paxillin B (PaxB) is a protein found in the fungus *Aspergillus nidulans* that is suspected to play a role in cell growth and division as a scaffolding protein. We have used GFP tagging to show that PaxB localizes to growing hyphal tips and to sites of septation (sites of cell division). This finding led us to hypothesize that PaxB plays an integral role in growth and division. This hypothesis was supported when we deleted the PaxB gene from the *A. nidulans* genome and found that formation of septa was impaired. Additionally, we have conducted a complementation experiment in which a functioning copy of the PaxB gene corrected the aseptate phenotype seen in the *sepD1* temperature-sensitive strain. Most recently, we generated a strain lacking the PaxB gene while expressing GFP-tagged chitin synthase (ChsA) to show that localization of ChsA to maturing septa is diminished but not completely inhibited. Additionally, we have obtained

preliminary evidence identifying potential binding partners to PaxB by utilizing GFP-Trap, a variant of co-immunoprecipitation.

#35 *Defining the functional bases within centromeric promoters*

Arati Joshi and Bayly Wheeler, Department of Biology

Faculty Sponsor: Bayly Wheeler, Department of Biology

During cellular division, DNA is duplicated and partitioned such that the two new cells inherit the same genetic information. Failure to form a centromere, a complex of DNA and proteins, causes errors in DNA division and can cause developmental defects in humans.

Heterochromatin, a condensed form of DNA and DNA-associated proteins, is necessary for centromere formation. Previous work has shown that RevCen, a transcribed DNA sequence present in multiple copies at the centromere, is sufficient to recruit heterochromatin and silence nearby genes. To test whether RevCen transcription is important for silencing, we engineered versions of RevCen without a promoter. We show that RevCen-mediated gene silencing is partially dependent on the presence of its promoter. Future work will confirm that the loss of gene silencing is accompanied by a loss of heterochromatin and will determine whether RevCen transcript levels decrease when the promoter is absent. To define the functional bases within the RevCen promoter, we will create a series of promoter deletion fragments and measure their ability to initiate transcription and establish heterochromatin. This work demonstrates that the RevCen promoter is important for gene silencing and will identify specific sequences within the promoter that are necessary for transcription and heterochromatin establishment.

#36 *Characterizing the strength of individual centromeric promoters and their effect on heterochromatin establishment*

Meryl Musicante and Bayly Wheeler, Department of Biology

Faculty Sponsor: Bayly Wheeler, Department of Biology

Centromeres are essential for chromosome segregation during cell division. In *Schizosaccharomyces pombe*, heterochromatin contributes to centromere formation by recruiting CENP-A, the centromere-specific histone variant. Heterochromatin forms at repetitive DNAs, but what enables these repeats to establish heterochromatin is incompletely understood. RevCen is a family of transcribed repeats that establishes heterochromatin at the centromere via the RNAi pathway. Our lab has shown that copies of RevCen differ in their ability to produce siRNAs and recruit heterochromatin. Our goal is to determine whether endogenous genetic variation within the RevCen promoter affects transcription and the ability of a repeat to establish heterochromatin. To measure the expression of a single copy of RevCen in a pool of highly similar centromeric transcripts, we engineered a version of RevCen with a novel seven base pair tag and have validated quantitative PCR primers that specifically recognize it. These results show that the tag enables the detection of individual copies of RevCen without affecting their function. Having validated the tag, we will quantify RevCen promoter strengths and assess

whether the transcription of different RevCen variants is correlated with their ability to establish heterochromatin.

#37 *Determining DNA Sequences Responsible for Heterochromatin Formation in S. pombe*

Lauren Benfield and Madison Holton

Faculty Sponsor: Bayly Wheeler, Department of Biology

Centromere formation is required for proper chromosome segregation in cell division. One result of improper chromosome segregation is miscarriage. In fission yeast, centromeres are composed of centromeric chromatin and heterochromatin. Heterochromatin facilitates centromere formation and silences gene expression. RevCen, a transcribed DNA sequence found within all three centromeres, is sufficient to establish heterochromatin when removed from the fission yeast centromere. To identify the sequences within RevCen that are important for its function, we created copies of RevCen that lack either the first or second half of the transcript. These truncated versions of RevCen were inserted into plasmids that contain the *ade6* gene and integrated into the yeast genome. We will monitor *ade6* expression to determine whether truncated copies of RevCen can silence gene expression. In adenine-limiting conditions, yeast that have silenced *ade6* turn red, whereas yeast that have not silenced *ade6* are white. Therefore, if either the first or second half of the transcript is required for heterochromatin establishment, we would expect yeast colonies lacking the corresponding segment to be white. By discovering the sequence required for heterochromatin formation, there will be a greater understanding of how centromere formation is initiated, resulting in proper chromosome segregation.

#38 *Habitat use by Loggerhead Shrikes (Lanius ludovicianus) in the Lower Mississippi Alluvial Valley*

Brian Christman, Aidan O'Reilly, Peter Dorn, Claire Levesque, and Maria Popescu

Faculty Sponsor: Michael Collins, Department of Biology

Loggerhead Shrikes (*Lanius ludovicianus*) are widely distributed across North America, but populations have declined precipitously over the past 50 years. Shrikes occur in open habitats such as grasslands and shrubland, and hypotheses for their decline include habitat loss and degradation and changing agricultural practices. Understanding the winter ecology and population demography of shrikes has been identified as research priorities for conservation and management. To address these research needs, we conducted point counts between November 2016 and March 2017. At each site, we measured vegetation and used GIS to quantify land cover to characterize habitat use in winter. Land cover data include the percentage of land that is forest, grassland, developed, wetland, or cultivated crops. Site occupancy in winter was 23%, and repeated surveys and relocations of marked birds indicate that detectability is low or that shrikes readily move across the landscape. Preliminary analyses show no relationship between shrike habitat use and our land cover variables. Behavioral observations suggest that shrikes might depend heavily on rights-of-way (narrow strips of grassy habitat between roads and agricultural

fields). Future work will test whether habitat features, such as the width and height of grasses and presence of perches, along rights-of-way relate to shrike presence.

#39 *Treefall Gap Dynamics in an Urban Old Growth Forest*

Griffin Williams, Marilyn Long, Mac Wilson, and Tara Massad

Faculty Sponsor: David Pike, Department of Biology

Treefall gaps are a critical component of forest dynamics that lead to the recruitment of a new cohort of seedlings and gap closure. Overton Park is an urban park with 126 acres of old growth forest, and long-term observations suggest gaps within the forest are failing to regenerate. Possible explanations include lower rates of seed arrival in gaps, low germination rates of seeds, competition from invasive and native plants, and seedling mortality from herbivory. From 2015-2018 we studied ten forest gaps to determine seed production, the tree species responsible for producing those seeds, and the recruitment of those seeds into seedlings. We also monitored for invasive plant species that could impact seedling survival and growth. Our findings suggest that seed richness and seedling diversity are higher in forest areas compared to gaps and that seedling diversity is negatively influenced by invasive species cover. Gap regeneration is therefore affected by seed dispersal and seedling survivorship and management of invasive species is necessary for forest regeneration.

#40 *Synthesis of peptides of the CTLD1 domain on the PLA2R antigen in idiopathic membranous nephritis to determine epitope site locations*

Zara Parkinson, Sakura Horiuchi, Candace Hayes, and Colin Welsh; Shana Stoddard, Roberto de la Salud Bea, and Kimberly Brien, Department of Chemistry

Faculty Sponsor: Kimberly Brien, Department of Chemistry

Phospholipase A2 receptor (PLA2R) is an antigen identified in Idiopathic Membranous Nephritis (IMN), an autoimmune disease that produces damage and eventually complete kidney failure. Patients with this disease have been identified to have single nucleotide polymorphisms (SNPs) which are believed to produce mutations in CTLD1. The CTLD1 domain is one of the domains on the PLA2R antigen that has been identified as having an epitope site (the part of an antigen which the auto-antibody binds to). We sought to determine if these mutations illicit a true immunological response. Thus performed computational prediction of where epitope sites on the CTLD1 domain might exist. We compared the native version and the three possible mutated versions of the CTLD1 domain. We have also synthesized two mutated peptides and the native sequence of a section of the CTLD1 domain to be used in ELISA assays to test if the mutated peptides prevent the antibody from binding this domain on PLA2R receptor.

#41 *Diels-Alder Reaction to Synthesize Biologically Active Molecules*

Emmaline Wittwer and Dana Horgen, Department of Chemistry

Faculty Sponsor: Dana Horgen, Department of Chemistry

An ethanol extract from the roots of *Boesenbergia pandurata* shows bioactivity which is harmful to the cells of PANC-1 human pancreatic cancer. Additionally, fifteen other molecules have been identified via purification of the extract. Dr. Horgen's lab is working to synthesize these compounds. All of the target compounds have a similar core structure. We will work to make this core structure using a Diels-Alder reaction. This reaction will use a catalyst, aluminum hexagonal silica (Al-HMS), which will be synthesized from tetraethyl orthosilicate, aluminum isopropoxide and hexadecylamine. The use of this catalyst has been shown to lead to high yields in the Diels-Alder reactions between similar diene and chalcone dieneophiles. Finding a reliable way to make this core structure will provide the first step in a route to make the identified biologically active compounds that could be used to create an anticancer drug.

References

#42 *Design of Epitope Binding Monobodies as a Potential Therapeutic Tool for Autoimmune Kidney Disease*

Omar Stocks and Liam Goldman

Faculty Sponsor: Shana Stoddard, Department of Chemistry

Autoimmune disease (AD) occurs in the body when antibodies erroneously target the cell receptors of healthy tissue, leading to the death of those cells. This can lead to long-term diseases and in some cases, death. Modern therapies for AD include the use of immunosuppressive medicines, which greatly weaken the immune system and its ability to protect against true pathogens such as the flu. This highlights the need for much more specific ways to treat AD without compromising the integrity of the immune system. Idiopathic membranous nephropathy (IMN) is an organ specific AD, which is treated with immunosuppressive medicines. Seventy percent of patients affected by IMN produce antibodies that target the phospholipase A2 receptor (PLA2R). PLA2R contains 10 different extracellular domains, and the one this research focuses on is the c-type lectin domain 7 (CTLD7). In this work, antigen specific binding proteins are being produced that will outcompete the autoantibodies by binding to CTLD7 and covering the receptor, thus keeping the cell alive. Using Epitopia and EPCES, three possible epitope sites on CTLD7 were identified and characterized. Protein caps that will bind to these three epitope sites are being designed and binding ability is being tested with a protein-protein docking server called ROSIE. Currently mutations are being made to multiple different caps in order to improve binding potency to CTLD7. This research has the potential to provide patients with a much more specific treatment for AD that prevents weakening of the immune system.

#43 *Further Synthesis toward a Polydentate Ligand for Future Catalytic Hydrogen Production*

Sam Trenner, Thomas Fowler, Alex Graves, and William Eckenhoff, Department of Chemistry

Faculty Sponsor: Dana Horgen, Department of Chemistry

Our target molecule, bis-acyltrifluoromethylpyridine, can be used to create a polydentate ligand. Once the ligand has been complexed to a transition metal, it will be tested as a catalyst for

hydrogen production. The previous attempts to synthesize bis-acyltrifluoromethylpyridine through a pyrylium salt were unsuccessful. In collaboration with Dr. Eckenhoff's lab, a new method has been employed for the synthesis of bis-acyltrifluoromethylpyridine. A mixture of chelidamic acid and thionyl chloride were used followed by treatment with methanol to afford chlorodimethylesterpyridine. This intermediate product was obtained in 27.5% yield. The product structure was confirmed by ¹H NMR shifts for 2H at 7.5 ppm and 6H at 4.0 ppm. The literature contained experimental procedures for the synthesis of chlorodimethylesterpyridine however complications arose from these procedures and multiple adjustments were needed to accomplish reaction successfully. The next step is to transform chlorodimethylesterpyridine to iododimethylesterpyridine followed by two more steps to get the desired bis-acyltrifluoromethylpyridine.

#44 *Derivatization and Detection of FAMES in Ancient North American Soapstone Artifacts* ■

Natalie Prodanovich, Stephen Carmody, and Jon Russ, Department of Chemistry

Faculty Sponsor: Jon Russ, Department of Chemistry

Prior to the production of pottery 3000 years ago, humans would often carve large bowls out of rock, usually soapstone. Samples of such an artifact from the Thrash site, a Late Archaic period (3,000-1000B.P.) site in Pike County, Alabama, have been subjected to a three step process for identifying fatty acids, the primary substance of foodstuffs. We used gas chromatography/mass spectroscopy (GC/MS) to analyze samples from the artifact along with samples of natural soapstone. The presence of different fatty acids can provide information about prehistoric dietary habits, whether from fish, mammals and/or plants. For the analysis, however, the fatty acids must be converted (derivatized) to fatty acid methyl esters (FAMES). We used a method that converts triacylglycerides into FAMES in a one step process. These fatty acids will be correlated to a range of plants and animals that came into an extended period of contact with the artifact.

#45 *Evaluation of hybrid and pure DFT methods for the binding of novel ligands in the tyrosine hydroxylase enzyme* ■

Rebecca Evans and Larryn Peterson, Department of Chemistry

Faculty Sponsor: Mauricio Cafiero, Department of Chemistry

The Tyrosine Hydroxylase (TyrH) enzyme contains a Fe²⁺. M06-2X, M06-L, and M06 have all been used to evaluate the binding strength of novel ligands in the TyrH active site. TyrH is the rate determining enzyme in the synthesis of the catecholamine, dopamine. TyrH converts tyrosine to L-DOPA. A crystal structure of the active site of Tyrosine Hydroxylase with a known inhibitor bound was obtained from the protein data bank (PDB ID: 2TOH). Dopaminergic derivatives were inserted into the enzymatic active site in silico to test the strength of the interactions between the substrate and active site, to determine if any of these derivatives could be effective inhibitors. M06-2X is a hybrid functional, while M06-L and M06 are both pure. While all the methods are suited for large complexes, such as the active site of an enzyme, M06-2X is stated to be best for interaction energies, M06-L best when a transition metal is present,

and M06 as an intermediate between the two. Preliminary results show significant differences between the methods within the same complex, as well as potential in determining a well-suited derivative, that has seeded other promising ligands.

#46 DFT Study of the Selectivity of Monoamine Oxidase B (MAOB)

**Audrey Woody and Samantha Jelinek; Larryn Peterson, and Mauricio Cafiero,
Department of Chemistry**

Faculty Sponsor: Mauricio Cafiero, Department of Chemistry

In the rational design of novel drugs, ligands are tailored to fit into a designated site on a target enzyme. While this approach can be very successful, it may lead to a molecule that is so carefully fitted to a binding site that a common point mutation may lead to loss of effectiveness of the drug. MAOB is an enzyme that is responsible for degrading penylethylamine, benzylamine, and dopamine and so plays an important role in neurotransmitter activity. Since Parkinson's disease results from a lack of dopaminergic activity, MAOB inhibitors may be used as a treatment for Parkinson's disease, because they stop the breakdown of dopamine. A suite of dopaminergic derivatives have been developed as potential inhibitors of the MAOB enzyme. The inhibitory effectiveness of these dopaminergic derivatives has been computationally modeled using the strength of interaction between each ligand and the enzymatic active site. The crystal-structure of the MAOB active site, docked with the widely employed diabetes drug pioglitazone, was isolated from the Protein Data Bank (PDB ID: 4A79). The derivatives were placed in the active site and common point mutations were introduced in key locations in the active site. The positions of the novel dopaminergic derivatives were then optimized in the active site using M062X/6-31G with implicit solvation and with flexible amino acid side-chains. Interaction energies between the ligands and the mutant protein were calculated using M062X with the 6-311+G* basis set. A comparison between the binding of novel ligands to wildtype and mutant MAOB will be presented.

#47 Analysis of Smoke Plants using Gas Chromatography-Mass Spectrometry in Archaeological Residue Analysis ■

Hope Elliott and Jon Russ, Department of Chemistry

Faculty Sponsor: Jon Russ, Department of Chemistry

Smoking pipes are often recovered during archaeological excavations, and the prevalence of this artifact makes it clear that smoking is a human activity that dates back at least four millennia. However, the plants that were smoked using these early pipes and the time period during which tobacco became the most commonly smoked plant remain unknown. Gas chromatography-mass spectrometry (GC-MS) is particularly useful for analyzing archaeological residues, where it can be used to identify compounds persisting within the matrix of archaeological smoking pipe fragments for millennia, including nicotine, a biomarker for tobacco. While tobacco detection techniques are relatively straightforward, protocol for the detection of other smoke plants like mint, wormwood, mugwort, and cedar is less developed because their chemical footprints have

not yet been thoroughly described. This study used GC-MS techniques to analyze various plant extracts and investigate their chemical nature. Plant samples were also experimentally combusted to simulate the smoking process, and combustion products were identified. By analyzing smoke plants and their combustion products, this study aimed to better define plants' chemical footprints so that more plant species can be identified in archaeological pipe residues using GC-MS.

#48 *In silico* characterization of the β 2-glycoprotein I epitope domains for the treatment of systemic lupus erythematosus

Itthipoaln Rasasack and Shana Stoddard, Department of Chemistry

Faculty Sponsor: Shana Stoddard, Department of Chemistry

Autoimmune diseases occur when the body's immune system attacks healthy tissues and organs through the use of antibodies. Current treatments inhibit the patient's entire immune system through immunosuppressive drug therapies. These drugs decrease the body's effective immune response to genuine pathogens, increasing the patient's susceptibility to have major complications from basic infections. Treatments that can eliminate disease progression and preserve the healthy portion of the patient's immune system should be considered. The work here focuses on the development of protein monobodies capable of inhibiting interactions between the auto-antibody and antigen eliciting the immune response in systemic lupus erythematosus (SLE), a systemic autoimmune disorder. SLE affects a predicted 5 million individuals worldwide. The β 2-glycoprotein I (β 2GPI) is a proposed SLE autoantigen that can induce the production of dsDNA auto-antibodies. In silico programs Epitopia, EPCES and Chimera were used to predict and visualize epitope regions on β 2GPI domains 1-5. In silico program Rosetta was used to predict initial protein-protein binding scores between the monobody candidates (3K2M, 3T04, and 5A43) and the β 2GPI-domain 5, a proposed antibody-binding domain. Mutations to the monobody templates are being evaluated. Future experiments with ELISA assays will be conducted to test antibody inhibition by monobody caps in vitro.

#49 *Hydrogen Production Using Mo(O)3(tpa) Complex in Light Driven Systems*

Cameron Tinker and William Eckenhoff, Department of Chemistry

Faculty Sponsor: William Eckenhoff, Department of Chemistry

As our global population grows, our need for innovative energy sources also grows. One new energy source can be found through the use of artificial photosynthesis to produce hydrogen gas. Recent studies have shown the effectiveness of molybdenum complexes with polypyridine ligands acting as a catalyst for the artificial photosynthetic process. Mo(O)3(tpa) (tpa = Tris(2-pyridylmethyl)amine) is a promising complex for proton reduction because one of the pyridyl arms is uncoordinated and could act as a pendant base. The pendant base effect was confirmed by cyclic voltammetry and ¹H NMR. Cyclic voltammetry experiments showed redox waves at -1.968 V and -2.341 V vs. Fc/Fc⁺. In the presence of acetic acid, a catalytic wave, indicative of

hydrogen formation, was observed at -2.276 V vs Fc/Fc+. Mo(O)₃(tpa) was then applied to light-driven systems for hydrogen generation.

#50 Nickel Complexes with N₂S₂ Ligands for Electrocatalytic and Light-Driven Hydrogen Production

John Dewar and William Eckenhoff, Department of Chemistry

Faculty Sponsor: William Eckenhoff, Department of Chemistry

Recent research in hydrogen production has begun to investigate catalysts which use cheap or widely available metals, as current catalysts which use rare earth metals are too expensive for wide use. Nickel compounds with mixed N,S ligands have been shown to produce hydrogen gas in both electrochemical and photocatalytic systems. However, while some nickel N₂S₂ compounds have been shown to successfully generate hydrogen in both electrochemical and photochemical systems, they operated at significant overpotentials and in some cases decomposed into NiS_x nanoparticles. For this study, three nickel(II) complexes based on the thiasalen structure were investigated for their proton reduction capability. All three compounds were shown to electrochemically produce hydrogen. [Ni(tsalen)] (tsalen=N,N'-ethylene-bis(thiosalicylideneimine)) operated at the lowest overpotential with onset potentials at -1.4 V Vs SCE. The other two compounds [Ni(tsaltol)] and [Ni(tsalphen)] (tsaltol =N,N'-phenylene-bis(thiosalicylideneimine) , tsalphen=4-methyl-1,2-phenylene-bis(thiosalicylideneimine)) both had more negative potentials despite the increased delocalization on the ligand backbone. [Ni(tsaltol)] was a novel compound was completely characterized. Each complex was also investigated for its activity in light-driven systems.

#51 Novel Azulene Based Polydentate Ligands

Thomas Fowler and Dana Horgen, Department of Chemistry

Faculty Sponsor: Dana Horgen, Department of Chemistry

The purpose of this research is to synthesize new ligands/metal complexes based on similar known catalysts for hydrogen production. The general structure of the ligand involves an azulene core that is flanked by two aryl imine groups. Bis-acylated azulene and 2,4,6-trimethylazulene (TMA) are being reacted with either 2, 6-xylidine (AA) or 2-(2-aminoethyl)pyridine (AOP) resulting in four possible ligand structures. The synthesis of the ligands is a two step reaction, the first step involves adding a trifluoroacetic group to the 1 and 3 position of the TMA or azulene via electrophilic aromatic substitution, producing TFA TMA or TFA azulene. The second step adds the AA or AOP to the to the carbonyl group of the TFA TMA or TFA azulene forming the desired imine bonds. Synthesis of the AA TMA was confirmed using NMR and crystals have been formed, synthesis toward the other ligands is on going and will be followed with x-ray crystal analysis and metal complexation. The AA azulene has been synthesized in a monosubstituted form. The methods used in this research show a novel synthetic pathway for creating azulene imine ligands.

#52 Lockless Distributed Work Stealing

John Snyder and Brian Larkins, Department of Mathematics & Computer Science

Faculty Sponsor: Brian Larkins, Department of Mathematics & Computer Science

Work stealing is a scalable method of dynamic work distribution. Scioto, a work stealing API, had scalable support for distributed work stealing. However, it relied on locks gathered by the initiator side to allow for work stealing. This meant in order to steal work, it required three communications. We propose a new implementation of Scioto that is built on top of a different distributed memory abstraction that allows for only one communication per steal.

#53 Dosing of Perampanel in Children: Correlation with Serum Levels ■

Elizabeth Gaudio and James Wheless, University of Tennessee Health Center, Le Bonheur Children's Hospital Neuroscience Institute

Faculty Sponsor: James Wheless, University of Tennessee Health Center, Le Bonheur Children's Hospital Neuroscience Institute

INTRODUCTION: Anti-epileptic drug (AED) perampanel (PER) is approved for adjunctive use in children 12 and older. PER is metabolized by enzyme CYP3A4. Enzyme-inducing AED's (EIAED) taken concomitantly are known to influence serum levels. This study investigates PER dose, serum levels and the effect of concomitant EIAED's on LeBonheur patients prescribed PER between Jan 2013 and May 2017. **METHODS:** A retrospective chart review involving data extraction of patient age, PER serum level, weight, prescribed PER dose, and concomitant drugs was performed. Patients were organized into age groups and concomitant EIAED presence. **RESULTS:** Of the 86 patients included in the study, 41 of them were concomitantly prescribed an EIAED. Although prescribed PER dose did not differ between patients concomitantly prescribed EIAED's and those not prescribed EIAED's, PER serum levels were significantly lower in the EIAED group. A previous study reported that PER efficacy increases with serum level. However, the average PER serum level for the EIAED group was still well above the previously reported efficacious serum concentration of 70 ng/mL PER. **CONCLUSION:** PER is likely to be efficacious in patients on EIAED's and not on EIAED's, however it is likely that efficacy is improved in patients not concomitantly prescribed EIAED's.

#54 Pervasive Motor Deficits Beyond Lesioned Hemisphere in Pediatric Arterial Ischemic Stroke ■

Kaylin Ryan, Rhodes College; Roozbeh Rezaie, Asim Choudri, Nicole Shay, Christen Holder, Tracy Tidwell, Paras Bhattarai, and Shalini Narayana, Le Bonheur Children's Hospital; Felipe Salinas, University of Texas Resonance Imaging at San Antonio, TX

Faculty Sponsor: Jason Haberman, Department of Psychology

Introduction: Pediatric arterial ischemic stroke (AIS) carries significant consequence of persistent motor deficits. However, the cortical mechanisms of motor recovery following stroke in children are seldom assessed. **Hypothesis:** We hypothesized that the behavioral and neurophysiological motor measures in the lesioned hemisphere would be altered. **Methods:**

Motor (indexed by TMS and fMRI) and behavioral measures were obtained in 8 children with AIS and 10 healthy age matched cohort (HC). Results: When compared to HC, patients with AIS demonstrated increased inhibition measured as ipsilateral silent period by TMS in both lesioned and contra-lesional hemispheres, while the measures of cortical excitation, in both hemispheres were found to be similar. fMRI during a finger-tapping task showed decreased strength and volume of activation in the primary motor cortex, supplementary motor area and cerebellum in the lesioned, compared to the contra-lesional hemisphere. Clinical motor evaluation showed gross functional recovery, but fine motor control was significantly impaired in both hemispheres. Conclusions: Consistent with our hypothesis, we observed network-wide hemodynamic decrease in the lesioned hemisphere. In addition, our data demonstrate impaired inhibitory circuitry and fine motor behavior extending to the contra-lesional hemisphere indicating pervasive dysfunction of both lesioned and contra-lesional hemispheres in pediatric AIS.

#55 No change in perceived hand size after Rubber Hand Illusion induction

Sam Thomasson and Jason Haberman, Department of Psychology

Faculty Sponsor: Jason Haberman, Department of Psychology

The human brain develops a representation of one's own body by integrating visual, proprioceptive, and somatosensory information into a coherent whole. This representation can be altered or disrupted when the sensory input is altered. The Rubber Hand Illusion (RHI) can be used to induce ownership of a fake hand into a subject's self-representation. Although the RHI may be robustly induced by objects that only vaguely resemble a real hand (e.g., a rubber glove), it remains unknown whether the size representation of one's hand may be manipulated by changing the size of the inducer. In this experiment, we tested whether induction of the Rubber Hand Illusion can alter an observer's hand size representation toward the size of the fake hand. Before and after induction of the Rubber Hand Illusion, observers were shown images of their own hand at various sizes and asked whether the image was smaller or larger than their real hand. After successful induction of the illusion, observers' responses did not show a change in perceived size of their own hand. This implies that observers may experience ownership of the hand while not integrating all features of the hand (e.g., size) into their own body representations.

#56 Conceptual size ensembles cannot be predicted by individual item size representations

Sneha Suresh and Jason Haberman, Department of Psychology

Faculty Sponsor: Jason Haberman, Department of Psychology

The visual system compresses redundant information into efficient, ensemble representations by averaging features across items. Ensemble perception operates with remarkable flexibility, even integrating object information at a conceptual level. For example, given a sufficiently strong depth cue, the visual system represents the perceived size of a set of triangles as opposed to their physical size (i.e., it accounts for size constancy; Suresh, Thomasson, & Haberman, VSS, 2017). In the current set of experiments, we explored whether conceptual ensemble size representation

may be predicted by the size representation of the individual items composing the group. In every trial, observers viewed an individual triangle with and without linear perspective cues and judged whether a subsequently presented test triangle was larger or smaller than the preceding triangle. Whereas observers were biased to perceive the average size of multiple triangles as larger when presented in the context of linear perspective cues (i.e., conceptual size averaging), they did not take those cues into account when estimating the size of a single triangle. That is, observers perceived a single triangle in the context of linear perspective cues as the same size as a single triangle without linear perspective cues. These results suggest the generation of a conceptual size ensemble cannot be predicted by the individual item representations, which points to an emergent calculus that depends on judgments at the group level.

#57 Speckle “movement” by deformable mirror as exoplanet direct imaging technique ■

Anna Murphree and Elizabeth Young, Department of Physics

Faculty Sponsor: Elizabeth Young, Department of Physics

The detection of exoplanets, planets in other solar systems, takes many forms. The most common method, observing the transit of exoplanets across their stars, effectively discovers planets close to their stars in edge-on systems. Once discovered, exoplanets may be characterized through direct imaging, allowing for their chemical makeup to be analyzed through spectroscopy and their habitability to be examined. This technique’s main challenge is isolating the planet’s light from the overwhelming light of the star. To achieve this, coronagraphs are used to redirect the star’s light, allowing for planet detection. Atmospheric differences, temperature fluctuations, and imperfect optics cause dim star light in the image (called speckles) which hide the exoplanet’s light among them. In this research, a deformable mirror is utilized to “move” these speckles in order to identify the stationary exoplanets. The laboratory consists of a laser, which serves as the star’s light; an optical setup, which fits the laser’s size to the deformable mirror and camera; a deformable mirror with 140 actuators; and an astronomical camera. Initial work shows that these speckles may be manipulated using Zernike polynomials on the deformable mirror. Further research will explore more complex ways to deform the mirror and analyze the images taken.

#58 Analysis of backscatter signals from bone using a two parameter and three parameter exponential fit

Aubrey Gray, Phoebe Sharp, and Brent Hoffmeister, Department of Physics

Faculty Sponsor: Brent Hoffmeister, Department of Physics

Osteoporosis is a degenerative bone disease that causes normally porous bone tissue, called cancellous bone, to become more porous and weak. Ultrasonic techniques may be used to detect changes in cancellous bone caused by osteoporosis. The goal of the study is to determine if the decay in the amplitude of an ultrasonic backscatter signal from cancellous bone correlates with bone density. Ultrasonic backscatter measurements were performed on 29 specimens of cancellous bone prepared from the distal end of 5 human femurs. The backscatter amplitude decay constant was measured using a two parameter (BADC2) and three parameter (BADC3)

exponential fit. Linear regression analysis was used to determine the correlation between BADC and bone density. BADC2 and BADC3 demonstrated highly significant ($p < 0.001$) linear correlations with bone density, however BADC2 yielded slightly stronger correlations ($0.75 \leq R \leq 0.84$) than BADC3 ($0.64 \leq R \leq 0.76$). The results of the study suggest that the decay in the amplitude of ultrasonic backscatter signals from cancellous bone may be sensitive to changes in bone caused by osteoporosis.

#59 *Ultrasonic Bone Assessment Using a Backscatter Difference Technique*

Luke Fairbanks, Sheldon Ebron, Joey McPherson, and Brent Hoffmeister, Department of Physics

Faculty Sponsor: Brent Hoffmeister, Department of Physics

Osteoporosis is a bone disease which disrupts the balance of cell destruction and new cell construction within bone. This decay leads to increased porosity within the bone tissue and heightened fracture risk. The focus of our research is the diagnosis of the bone disease osteoporosis with ultrasound. An ultrasonic wave centered around 3.5 MHz is sent into 55 cubic bone specimens taken from the porous interior of 14 donated femurs. The sound waves echo off of the bone, one device both sends and listens to the signal. The signal which is analyzed, the echo, is referred to as backscatter. The characteristics of the decay of the signal reveal the mechanical properties, mainly density, of the bone. The difference spectrum was averaged first over entire cubical specimen then again over the whole set of bone samples while varying the choices of where the signal was analyzed. This meta-analysis showed how the difference spectrum responds on average to analysis parameters. The difference spectrum changes when the time segments placed on the backscatter sound wave, the gates, change. Delaying the gates too late causes signal to noise ratio problems, and widening the gates gives finer resolution and shifts metrics such as the mean and slope of the difference spectrum. Conclusion: The difference spectrum does change on average when gate parameters vary, which informs the lab which choices might not be worth running through the analysis.

#60 *Representation of multiple ensembles across visual domains is more precise than within visual domains*

Delaney McDonagh and Jason Haberman, Department of Psychology

Faculty Sponsor: Jason Haberman, Department of Psychology

Ensemble perception allows us to rapidly derive summary statistical information from groups of similar objects. Although ensembles are generated quickly and efficiently, the capacity limitations of this process are still debated. The visual system can represent large numbers of items as a single average value, but current research suggests there is a limit to the number of ensembles one can simultaneously extract. We previously demonstrated that the number of ensembles the visual system can effectively represent may depend explicitly on the visual domain (Schill & Haberman, VSS, 2016). In the current study, we replicated and extended those findings. In each trial, observers viewed two ensembles presented simultaneously and were post-

cued to report the average of just one of the sets. The ensembles could either be mixed, in which two different visual domains were presented (e.g., faces varying in expression and colored patches varying in hue), or unmixed, in which two sets from the same visual domain were presented. Observers then adjusted a test stimulus to match the preceding set. The results revealed an overall benefit in ensemble representation in mixed conditions relative to unmixed conditions. That is, both average color and average expression representations improved when different ensemble types were present compared to when both sets came from the same visual domain. We conclude that attending to mixed ensembles reduces competition for neural resources, as different ensemble domains rely on independently operating mechanisms.

#61 Emotional judgments of individual scenes are influenced by unintentional averaging

Yavin Alwis and Jason Haberman, Department of Psychology

Faculty Sponsor: Jason Haberman, Department of Psychology

The visual system uses ensemble perception to summarize visual input across a variety of domains. This heuristic operates at the highest levels of vision, compressing information as complex as emotion, animacy, and scene valence into an efficient representation. Previous work has shown the average size of a set can influence the perceived size of an individual item, and vice versa (Brady & Alvarez, 2011), but it has yet to be demonstrated whether such effects emerge for high-level stimuli, specifically, emotional scenes. In the current experiment, we tested whether the perceived emotional valence of a single scene could be influenced by surrounding, simultaneously presented scenes. Observers first rated the emotional valence of a series of individual scenes. Observers then saw ensembles of the original images and were cued to rerate just one of the four. We predicted the perceived emotional valence of the cued image would be pulled toward the mean emotion of the surrounding ensemble. Results confirmed this. The correlations across observers revealed that the bigger the difference between the valence of the ensemble and the valence of the cued image, the more the rating of the cued image shifted toward the average of the ensemble. We conclude that high-level ensemble information can influence how we perceive individual items in the crowd, even when that information is not directly task relevant.

#62 Ensemble representations are robust to noise inherited from the individual item level

Emma ZeeAbrahamsen and Jason Haberman, Department of Psychology

Faculty Sponsor: Jason Haberman, Department of Psychology

The visual system efficiently extracts summary statistical information from visual scenes (e.g., sets of oriented gabors, crowds of faces). Ensemble representation precision may in part be driven by the power of statistical averaging, which can be leveraged to overcome noise at the individual item level (Alvarez, 2011). The current experiments explicitly tested this by comparing the representation of noisy individual faces with that of noisy crowds. If the ensemble computation inherited noise from the individual item level in a linearly additive process, we would expect ensemble representations to suffer more with the introduction of noise. However,

this was not the case. Observers viewed either individual faces or sets of 4 faces masked in varying degrees of noise (no noise, low, medium, high) and had to adjust a fully visible test face to match the perceived individual or average expression. The difference in precision between the no noise condition and the noise conditions was analyzed in a 3 (noise) x 2 (set size) repeated measures ANOVA. This revealed a main effect of noise, but no effect of set size, indicating that performance did not depend on whether observers assessed a single face or a crowd of faces. The interaction was also not significant. Overall, the results are consistent with the notion that ensemble representations may be more robust to noise than might be expected based on the representation of individual items, a useful outcome given the often noisy inputs available for the ensemble calculus.

Social Sciences

#63 *Effects of Professor's Power in FYWS*

Andrew Murphy

Faculty Sponsor: Dee Birnbaum, Department of Business

We shared an online survey with online groups and student circles. Rhodes College has a small student body, so a common class schedule between students is the norm at the institution; every student is required to take the college's First-Year Writing Seminar. First-Year Writing Seminar, which may be abbreviated FYWS, was the focal subject of this study that focuses around multiple types of authoritative power a teacher may use in the classroom, and the willingness a student has to put forth more effort due to an instructor's usage of authority. The data will give a small glimpse of what motivates a student to attend class, given the teacher's employment of different types of authoritative power.

#64 *Reminding and Cognitive Control in Older and Younger Adults*

Layla Jubrial-Jaber

Faculty Sponsor: Geoffrey Maddox, Department of Psychology

One mechanism proposed to underlie the spacing effect (i.e., the memory benefit obtained by separating versus cramming study sessions) is the reminding account, which suggests that the benefit of spacing is only obtained when material is recognized as having been previously studied during subsequent study sessions. Critically, reminding may be influenced by a range of cognitive abilities (e.g., cognitive control) that decline with age. Thus, the current study examined differences in reminding in young and older adults. Specifically, participants learned two sets of word pairs. The second set was comprised of novel pairs presented once, novel pairs presented twice within the list, and pairs previously studied in the first set. Participants were instructed to respond 'yes' to any repeated pair (n-back reminding condition) or to respond 'yes' only to pairs repeated within the second set (list-back reminding condition). Finally, participants completed a cued recall test for all items in the second set. Consistent with predictions, results indicated that younger adults demonstrated more accurate reminding than older adults in the list-

back condition, but the reverse relationship was observed in the n-back condition. Discussion will consider the implications of the observed age differences in reminding for the spacing effect.

#65 *Distress and Symptom Change among Transgender and Gender Non-conforming Racial/ethnic Minorities*

Alexis Franklin

Faculty Sponsor: Tyler Lefevor, Department of Psychology

The current study employs an intersectional framework to understand how well counselors are meeting the needs of transgender and gender non-conforming (TGNC) racial/ethnic minorities (REM) clients by examining clients' initial anxiety and depression levels and changes in symptoms through psychotherapy. Data from 41,691 participants from the Center for Collegiate Mental Health 2012-2016 data set were analyzed. Results from hierarchical linear modeling indicate higher baseline anxiety and depression among TGNC clients and significant but minimally faster rates of change of depression symptoms among cisgender clients. REM clients presented with lower baseline anxiety, but higher baseline depression. REM clients demonstrated faster rates of change of depression, but no differences in rates of change of anxiety compared to White clients. No significant interaction effects between TGNC and REM identities were found, but main effects held such that TGNC REM clients experienced more distress than any other group.

#66 *Optimizing Well-being in Lesbian, Gay, Bisexual, and Same-Sex-Attracted Mormons*
Caldwell Huffmann and Isabelle Blaber

Faculty Sponsor: Tyler Lefevor, Department of Psychology

Little research exists on the intersection of sexuality and religiosity, especially in a Mormon context. Many conservative religions discourage same-sex identity, and prohibit same-sex sexual behavior, leading many sexual minorities in conservative religions to experience conflict. This study examines the psychosocial well-being of same-sex attracted (SSA) Mormons, using a new sample for analysis with a more diverse research team. The present study uses a subset of the data collected by Beckstead et al. 2018 from the 4 Options Survey to analyze mental health outcomes between four relationship statuses of LGB/SSA Mormons. In accordance with previous research, we propose that LGB/SSA Mormons' beliefs about religion and sexuality can significantly influence their well-being. We predict that those who report more positive sexual attitudes will also indicate better overall well-being than those who report negative sexual attitudes. Furthermore, those in affirming religious communities will demonstrate better overall well-being than those in non-affirming environments. The present study seeks to identify areas in which improvements can be made to optimize well-being among LGB/SSA members of the Mormon church. The broader topic of well-being (and how to optimize it) in this context is integral for those who counsel minority sexuality people of faith.

#67 *Does Rejecting an LGB identity label negatively effect mental health? A study of same-sex attracted Mormon adults*

Sydney Sorrell

Faculty Sponsor: Tyler Lefevor, Department of Psychology

In the Church of Jesus Christ of Latter-Day Saints (LDS), beliefs about same sex sexual attraction are carefully differentiated from beliefs about same sex sexual behavior and LGB identity labels. In the LDS church, same-sex attraction is accepted, but same sex behavior and LGB identity labels are viewed as sinful (Church of Jesus Christ of Latter-Day Saints 2007). This conflict between religious and sexual identities can complicate sexual identity development for individuals who experience same-sex attraction, and lead some same-sex attracted individuals to reject an LGB identity label (Label Rejecters). The present study uses data from the Four Options survey to examine the relationship between rejecting an LGB identity label and mental health outcomes in a sample of same-sex attracted Mormon adults. Although Label Rejecters were significantly more religious than LGB individuals, the two groups did not differ on resolution between religious and sexual identities. Furthermore, Label Rejecters demonstrated significantly higher levels of internalized homonegativity. The results of this study will increase our understanding of the effects of rejecting an LGB identity label on well being, while also expanding our knowledge of minority sexual identity development in LDS individuals.

#68 *Sexual Arousal and Sexual Aversion in the Context of Mixed-Orientation Relationships*

Zoe Feder, Emily Boss, and William-Michael Stone

Faculty Sponsor: Tyler Lefevor, Department of Psychology

Based on previous research, we expect White targets to be associated with higher levels of SES and Black targets with lower levels of SES. The Go/No Go Association Test (GNAT) will allow us to sort the associations and to assess whether Black Targets are associated with Low status words and occupations, whether White targets are associated with high status words or occupations, or whether both associations exist or do not exist. The shifting standards effect is the tendency for subjective judgments of targets to show null effects of stereotypes while objective judgements of the same targets show stereotypical effects. We're looking at the relationship between the strength with which someone holds the association from the GNAT and their tendency to shift standards in a race-SES paradigm. We would predict that those who exhibited the stereotypical association in the GNAT would exhibit a greater shifting of standards. Our findings demonstrate that those individuals with a strong Race-Status association show a greater shifting standards effect than those with a weak Race-Status association and these effects are primarily driven by the White-High Status association.

#69 *Rhythm and Remembering: Examining the Influence of Reminding on Memory for Rhythm in Music*

Emily Boss

Faculty Sponsor: Geoffrey Maddox, Department of Psychology

Research has yielded strong evidence for the spacing effect, the benefit in long-term memory obtained by spacing repeated study events with intervening time or material compared to massing study events. Although the spacing effect is robust and has been observed across a wide range of materials, research has often used discrete and readily verbalized stimuli. Whether or not the spacing effect extends to continuous stimuli has yet to be examined. Thus, the current study examined the spacing effect with auditory stimuli that are continuous in nature and cannot be easily verbalized. Participants were presented with short rhythmic passages which contained repeated rhythms separated by varying intervals (1, 5, or 9 intervening musical measures). Following each passage, participants completed a recognition test in which they were presented with the repeated rhythms from the passage and additional lures that resembled those rhythms. Results indicated that recognition of repeated rhythms was optimized with the use of an intermediate spacing interval that was neither too long nor too short which is consistent with the non-monotonic relationship between spacing and final test memory in verbal learning.

#70 *Training with spaced retrieval techniques improves performance in young and older adults*

Caroline Boyd-Rogers

Faculty Sponsor: Geoffrey Maddox, Department of Psychology

The current study examined how young and older adults implement and improve their use of spaced retrieval practice, a mnemonic technique in which individuals are periodically quizzed on to-be-remembered information. Specifically, on each trial young and older adult participants encoded face-name pairs and then engaged in an ongoing reading task. Participants were instructed to practice retrieving the name associated with each face throughout the reading task in either an equally spaced manner (i.e., two minutes of reading between each retrieval attempt) or in an expanded manner (i.e., retrieving after one, two, and three minutes). Following the passage, participants completed a final test on their memory for the face-name pairs and were also tested for their reading comprehension. Participants completed two practice trials and were provided feedback on how well they implemented the instructed retrieval technique. After completing two practice trials, participants completed the final, critical trial. Results from the critical trial revealed increased success in implementing the instructed strategy. Moreover, results indicated that face-name pairs were forgotten across time at a slower rate in the equal spaced retrieval condition compared to the expanded retrieval condition.

#71 *Emotional Valence and Point Value Influence Memory in Young and Older Adults*

Joy Hocut

Faculty Sponsor: Geoffrey Maddox, Department of Psychology

Research indicates that memory declines with age. One account of this decline, the Associative Deficit Hypothesis, suggests that older adults' ability to bind elements of an event is impaired compared to younger adults. The current study examined two factors that may reduce the associative deficit. First, the Socioemotional Selectivity Theory posits that older adults exhibit a positivity bias, in which they automatically attend to positive stimuli; conversely, younger adults

automatically attend to negative stimuli. In addition, research indicates that younger and older adults can engage controlled attention to prioritize the memorization of one subset of materials over another subset of materials. This has been demonstrated previously through the Value Directed Encoding Paradigm by which cognitive control is employed in order to prioritize value-based information. Importantly, research has yet to examine how these automatic emotional biases operate in congruence or in opposition to controlled attention and how this may influence memory for associations. Using the Value Directed Encoding paradigm, the current study investigated the ways in which emotionally valenced stimuli may interact in congruence and in opposition with point value. Findings may provide a more nuanced understanding of associative memory and offer valuable insight in addressing the associative deficit observed in older adults.

Fine Arts

#72 *Evolution of the Harp*

Petra Dhinakaran, Christopher Goza, Katarina Olsen, and Zhiyu Zhao

Faculty Sponsor: Gina Neupert, Department of Music

While the modern harp is often noted for its unique, beautiful structure, the angelic instrument appeared very different centuries ago. The history of the harp indicates that it is one of the oldest known instruments, having existed in one form or another, in every land and every age. Wall paintings of ancient Egyptian tombs dating from as early as 3000 B.C. show an instrument that closely resembles the hunter's bow without the pillar that we find in modern harps. Over the years, each culture has modified this whimsical soft-sounding instrument from its primitive hunting bow shape to its own variation. Together these alterations across the globe have helped create today's harp.

Deaf Studies Fellowships

#73 *ASL and English Mixing: Causes and Effects* ■

Lee Kezar

Faculty Sponsor: Lori Garner, Department of English

ASL is an independent language, but we often see it mixed with English both in sign and speech. This phenomenon can be ascribed to several different causes, ranging from more innocent reasons like ASL learners filling their knowledge gaps with English (Cokely, 1983) or bilingual, hearing people using both languages simultaneously (Bishop, 2010) to more serious forces like the assertion that D/deaf people must conform to the dominant language (Branson and Miller, 1998). The latter is particularly heinous and supported by pedagogical philosophies such as "Total Communication" (TC) and oralism. These paradigms work to marginalize ASL by distorting the language or ignoring it entirely. While TC may seem appealing because it attempts to teach lipreading and a signed language simultaneously, it does not follow ASL grammar, and even the most experienced teachers of the D/deaf tend to make many mistakes (Strong and

Charlson, 1987), resulting in diminished quality of education. Despite this, many oral schools for the deaf still adopt these paradigms, some going as far as to prohibit signed languages entirely. Instead, educators must understand that ASL is necessary and sufficient for deaf education, and anything less hurts the D/deaf community.

#74 *Deaf Space: Architectural Design for Deaf Students* ■

Abigail Connor

Faculty Sponsor: Lori Garner, Department of English

“Deaf-space,” a concept heavily influenced by Gallaudet University and architect Hansel Bauman, focuses on the importance of sight and the visual field. This type of architecture can “make a building porous, and create a fabric of visual connections throughout the building” (Tsymbal, 2010). Deaf design involves both Deaf architecture, space devised with the needs of D/deaf students in mind, and “adapted space,” where changes are added to preexisting buildings (Hauan, 2017). With these adaptations, D/deaf students are able to increase their communication and improve their ease of learning. Studies have found “a functional relationship between the physical environment and both an increase in levels of academic engagement and a decrease in levels of disruptive behavior” (Guardino and Antia, 2012). Unfortunately, a dishearteningly low percentage (75%) of teachers are adequately prepared to teach deaf and hard of hearing students (Underwood, 2003). Thus, even in schools not designed for the D/deaf, teachers should be supplied the resources to make their classroom environment function better for D/deaf students. My research outlines modifications to improve existing schools and to consider when constructing new schools, as well as the effects of purposeful design (or the lack of) on D/deaf students’ educations.

#75 *Deaf Entrepreneurship: How Policy Makers Can Support Deaf Entrepreneurs* ■

Seabelo John

Faculty Sponsor: Lori Garner, Department of English

This research discusses grassroots ways to support deaf entrepreneurs in the US, more importantly, how policymakers can adopt these measures and practically implement them in higher education institutions or businesses. The research prescribes three main practical policy drivers—counsel, accessibility and mentorship—that can be practically adopted and applied in policymaking for small businesses and new entrepreneurs entering the corporate. With regard to counsel, Pressman (1999) recommends that counselors understand deaf entrepreneurs’ personal, social and business backgrounds and demonstrate that a college degree is highly desirable, but not imperative, for an entrepreneurial career. To help provide accessibility for deaf entrepreneurs, Punch (2016) demands improvement at the corporate and organizational levels for both physical and communication accommodations such as rearranging furniture so that the person with hearing loss can see others better in the workspace or using e-mail or text messaging instead of telephone calls. On mentorship, Bosma et. al (2011) suggest programs that provide role models offer practical support and guidance to deaf entrepreneurs and students in their

business ventures. Policies that practically provide counsel, accommodation, and mentorship in schools and in the workplace can help ensure deaf entrepreneurship success.

POSTER SESSION II

Multi-Sports Forum in the Bryan Campus Life Center

4:00-6:00 pm

Poster numbers are listed with each title.

St. Jude Summer Plus Fellowships

#1 *The Effects of Mitochondrial Mutation of Tumorigenesis* ■

Danielle Healey and Xiujie Li Harms, St. Jude Children's Research Hospital, Department of Pathology

Faculty Sponsor: William Eckenhoff, Department of Chemistry

This paper investigated the activity of tumorigenesis within mitochondrially mutated progenitor cells. It seeks to answer how the epigenetics of mitochondrially mutated cells containing the N-Myc oncogene changes the rate of tumorigenesis. The experiment investigated the changes in methylation and acetylation of the N-Myc infected progenitor cells to determine the extent that gene expression and regulation were occurring at. It focused on the differences in acetylation and methylation regarding the different genotypes in the PolG mice model (wild type, heterozygous, homozygous) containing the N-Myc gene. Immunofluorescent imaging was used to quantify the changes in acetylation and methylation of the cells and establish the degree of change in the epigenetics compared to how the cells experienced changes in tumorigenesis. Preliminary results indicated decreased tumorigenesis in the homozygous N-Myc progenitor cells compared to the wild type and heterozygous models infected with N-Myc. Studies to determine the degree of change in acetylation and methylation between genotypes are ongoing.

#2 *Identifying Ubr4 substrates and regulators of muscle growth* ■

Jared Stover and Liam Hunt PhD, St. Jude Children's Research Hospital, Department of Developmental Neurobiology

Faculty Sponsor: Bayly Wheeler, Department of Biology

Protein homeostasis, or proteostasis, involves regulation and coordination of protein synthesis and degradation. The Ubiquitin-proteasome pathway is a principal protein degradation pathway and key to maintaining skeletal muscle proteostasis during growth and aging. Ubr4, a member of the Ubr ubiquitin ligase family, was previously identified as a conserved muscle growth regulator across multiple model systems. Loss of Ubr4 produces muscle hypertrophy, and by proteomic analysis resulted in elevated levels of several proteins, suggesting Ubr4 may target these proteins for degradation and they may play a role in regulating muscle growth. Here we

tested whether the proteins identified by proteomic analysis are direct substrates of Ubr4 by co-immunoprecipitation experiments. The proteins Ube2b, Hat1, Rbbp4 and Rbbp7 were shown to interact with UBR4 and required Ubr4 for ubiquitination. Tissue specific UBR4 silencing leads to increased growth of the eyes and muscle in *Drosophila Melanogaster*. Epistatic analysis in the eyes confirmed that several proteins regulated by UBR4, including HAT1 and PCNA, were necessary for this loss of UBR4 dependent growth phenotype. Silencing of HAT1 and PCNA also inhibited muscle growth. Loss of HAT1 in combination with loss of UBR4 in muscle prevented hypertrophic growth, indicating that increased HAT1 is necessary following loss of UBR4 for hypertrophy. This study establishes direct substrates of Ubr4, which emerge as novel regulators of muscle growth.

#3 *Implementing standardized patient handoff procedures for interdepartmental transports between inpatient and OR* ■

Ellie Sommerkamp, Jonathan Burlison and James Hoffman

Faculty Sponsor: Alan Jaslow, Department of Biology

One of the most vulnerable areas patient care is during patient handoffs and transfers, and The Joint Commission reported that communication failures are the leading contributing factor in medical errors that result in severe harm. Standardizing handoff communication formats can reduce errors and patient harm. The use of one mnemonic handoff system, IPASS, has demonstrated a 30% reduction in preventable patient harm and emerged as a best practice. This quality improvement project adapted the IPASS for patient transfers between the operational room (OR) and inpatient care units. Project leaders have collaborated with OR staff to successfully revise the method in respect to the details of inpatient to OR handoffs. Sustainment of IPASS use will be enforced by OR project collaborators conducting direct observations of their peers delivering handoffs and provide immediate feedback of handoff performance. Using a validated data collection tool, staff will document observed handoff performances and these data will inform continuous improvement efforts. Development of IPASS for OR to inpatient unit handoffs is nearing completion, and data from other interdepartmental handoffs that have been using IPASS will be analyzed to visualize how IPASS data will be similar for this new setting.

#4 *Observing Patterns of Antibiotic Resistance in Pneumonia* ■

Erin Dindoruk, Rhodes College; Jason Rosch, Department of Infectious Diseases, St. Jude Children's Research Hospital; Haley Echlin, Department of Infectious Diseases, St. Jude Children's Research Hospital

Faculty Sponsor: Dhammika Muesse, Department of Chemistry

Pneumonia is one of the most common bacteria that infect humans. Over the years pneumonia has gained resistance to many commonly used antibiotics. The goal of this experiment is to observe the rate of resistance of pneumonia for several different antibiotics: Bactrim, Rifampacin, and Trimethoprim. The experiment involved exposing 4 different strains of bacteria to blood-agar plates mixed with the antibiotics. The colonies of bacteria were individually

counted on each plate. Plates with a greater number of colonies indicated greater resistance. The strains included T4, a wild type strain, Δ HexA, a mutant with a higher frequency of mutation, Δ ComeC, a mutant with a lower frequency of mutation, and a hybrid of Δ HexA and Δ ComeC. It was predicted that the Δ HexA would have the greatest number of colonies, and Δ ComeC would have had the smallest. For Rifampacin this appeared to be the case. For Bactrim, however, T4 shows the highest resistance over all the other strains. According to our results, Bactrim is a less effective antibiotic than Rifampacin.

#5 Targeting histone demethylase KDM6B for treatment of neuroblastoma ■

Anoushka Mullasseril, Rhodes College; Tara Rakiewicz, Drexel University; Jun Yang, Department of Surgery, St. Jude Children's Research Hospital

Faculty Sponsor: Kimberly Brien, Department of Chemistry

Neuroblastoma is a cancer of the sympathetic neuron system that accounts for 15% of all childhood cancer-related deaths, an unusually high proportion based on the fact that it accounts for 7% of childhood malignancies. The survival rate for high-risk neuroblastoma is only 40% with current treatments including chemotherapy and radiation which cause unwanted side effects. There is growing interest to develop novel therapies by targeting epigenetic factors. KDM6B, a histone demethylase also known as JMJD3, is known to play a role in various types of cancer such as NOTCH1-mediated T-cell acute lymphoblastic leukemia. However, the role of KDM6B in neuroblastoma is largely unknown. Our previous studies indicate that KDM6B may serve as a new therapeutic target in neuroblastoma. We therefore hypothesize that pharmacologically targeting KDM6B could prove to be therapeutic in the treatment of neuroblastoma. To better understand the role of KDM6B, we utilized siRNA transfection and shRNA to inhibit KDM6B expression. We further tested a drug called GSK-J4 which targets the KDM6B protein. These studies have shown that genetic or pharmacologic inhibition of KDM6B could be a promising treatment for neuroblastoma, but more research is needed to understand the pathways involved.

#6 Constituents of *Brunfelsia Grandiflora* Against Pediatric Malignancies ■

Rachel Bassett, Rhodes College; Fatima Rivas, Department of Chemical Biology and Therapeutics, St. Jude Children's Research Hospital; TaoTao Ling, Department of Chemical Biology and Therapeutics, St. Jude Children's Research Hospital.

Faculty Sponsor: Mauricio Cafiero, Department of Chemistry

Leukemia is the most common pediatric cancer with 75% of these cases being acute lymphoblastic leukemia (ALL). While the pediatric ALL survival rate is high (~90%), relapses still occur following treatment in about 20% of patients, which at this state their prognosis is poor. Relapse usually includes a cell phenotype that is resistant to drug treatments. Particularly, relapse ALL in many patients exemplify up-regulated resistance to glucocorticoids, a widely utilized drug treatment. Natural products are known to have many secondary metabolites that can serve as therapeutic agents. Primary cytotoxic assays of various natural products were screened

against a focused cellular cancer panel. Following dose response assays against sensitive and resistant B-cell ALL models, *Brunfelsia grandiflora* was identified. Now, our studies are focused on identifying potential hits against ALL cell lines and determining the bioactivity of the fractions of *Brunfelsia grandiflora*. Cell viability was determined using the proliferation assay CellTiter-Glo. Here, we describe our promising findings and highlight one of the natural products' extract fraction, found in *Brunfelsia grandiflora*. Ongoing studies are focused on structure elucidation and characterization of promising compounds in the natural product fractionations. Further, mechanistic mode of action studies of the chemical composition of *Brunfelsia grandiflora* will be reported in due time.

#7 *YBX1* Regulates Cell Proliferation in Developing Neural Tubes ■

Luis Milburn and Jennifer Loomer, Rhodes College; Myron Evans, St. Jude Children's Research Hospital, Department of Developmental Neurobiology; Jamy Peng, St. Jude Children's Research Hospital, Department of Developmental Neurobiology
Faculty Sponsor: Jamy Peng, St. Jude Children's Research Hospital, Department of Developmental Neurobiology

Cell proliferation in the developing neural tube is essential to the development of the nervous system. The balance of stem cell proliferation and differentiation requires the coordination of molecular processes including epigenetic mechanisms, which regulate gene expression profiles. One epigenetic mechanism involves the PRC2 complex, a histone methylase that has been shown to play a role in cellular differentiation, perpetuation of cellular identity, proliferation, and stem cell plasticity. Our studies of the PRC2 complex led to the identification of a new PRC2-binding protein called YBX1, which is a proliferation regulatory factor highly expressed in the brain. Quantification of cell division in the neural tubes of mice using immunofluorescent sections of both *Ybx1* +/- and *Ybx1* -/- shows that *Ybx1* knockout results in increased cell division. A separate experiment using fluorescence activated cell sorting (FACS) confirmed our findings from immunofluorescence quantification. Altogether, our findings suggest that YBX1 modulates cell proliferation in the developing neural tube.

#8 *Granule neuron differentiation status and substrate modulate the Netrin-1 signaling response in the cerebellum* ■

Lelo Shamambo, Rhodes College; Christophe Laumonnerie, Developmental Neurobiology, St. Jude Children's Research Hospital; David Solecki, Developmental Neurobiology, St. Jude Children's Research Hospital
Faculty Sponsor: Kelly Dougherty, Department of Biology

During development, granule neuron progenitors often have to migrate over long distances from their germinal zone to their final location. They navigate by integrating chemorepulsive or chemoattractive guidance cues, which sometimes come from the germinal zone through guidance molecules. However, it is unclear how neurons, upon differentiation, modulate their response to a given signal. In this study, we focus on the guidance-signaling protein Netrin-1 (Ntn1) and its

role in mouse cerebellar development. Using FACS sorting to isolate the granule neurons of Atoh1-GFP transgenic mice cerebella based on their differentiation status, we ran an in vitro gradient assay to track the netrin-driven migration patterns of different stages of granule neurons based on their GFP fluorescence on two substrates: laminin and vitronectin. We show that granule neurons display different migration behaviors in response to Ntn1 depending on their differentiation status and the surrounding substrate.

Biology 141

#9 *The Effect of White Noise Frequency on Cricket Feeding*

Ellie Aronson, Catherine del Rosario, Erin Dempsey, and William Shao

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#10 *The Effects of a Refuge on Agonistic Behavior of Crayfish*

Price Campbell, Rachel Heimann, Trip Martin, and Greta Pohlman

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#11 *Effects of Salt Water on Brassica rapa Stem Growth*

Brian Christman, Zara Parkinson, and Andrew Lempner

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#12 *Effects of Morning and Afternoon Sunlight on Adaxial Leaf Stomatal Density of On-Campus Plants*

Mary Camille Lovely, Remi Parker, and Emma Thames

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#13 *Domestic Cricket Response to Predatory Scent Stimulus*

Megan Lucas, Sam Naidis, and Nicole Seguy

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#14 *The Effects of Higher Levels of Light Intensity on the Number of Lichen Organisms*

Vindhya Pasupuleti, Annelise Swords, and João Pedro Veloso

Faculty Sponsor: Carolyn Jaslow, Department of Biology

#15 *The effect of Miraclegro on agonistic behavior in crayfish*

Natalie Arnold, Jada Fortson, Chris Gough, and Samantha Wood

Faculty Sponsor: Stephanie Haddad, Department of Biology

#16 *Effects of variable sound frequencies on cricket behavior*

Tabitha Diehl, Ashley Foret, and Sierra Gage

Faculty Sponsor: Stephanie Haddad, Department of Biology

#17 *The effects of con-specific and conspecific male house cricket mating calls on female house cricket phonotactic behavior*

Ariel Chavers, Preston Giroux, and Abby Lidoski

Faculty Sponsor: Stephanie Haddad, Department of Biology

#18 *The effect of copper sulfate on duckweed growth*

Katie Gaffney, Srisowmya Manohar, and Kishan Sinojia

Faculty Sponsor: Stephanie Haddad, Department of Biology

#19 *The effects of rough or smooth bark on lichen coverage in Overton Park*

Mckenzie Dorris, Jace Franklin, Betsy John, and Rachel Ward

Faculty Sponsor: Stephanie Haddad, Department of Biology

#20 *Measuring lichen growth and distribution in proximity to road pollution*

Kelsey Glasper, Nada Lelovic, Maya Longacre, and Gelleana Mendez-Morales

Faculty Sponsor: Stephanie Haddad, Department of Biology

#21 *Effective Growth of Wisconsin Fast Plants Brassica Rapa*

Jacob Andersen, Bernadette Badamo, Dalton Huffman, and Vigi Krishnan

Faculty Sponsor: David Pike, Department of Biology

#22 *Do crayfish of the same sex become more aggressive when a crayfish of the opposite sex is added into the environment?*

Kami Chauncy, Caroline Farrell, and Teasha Dogra

Faculty Sponsor: David Pike, Department of Biology

#23 *Is Cricket Growth Rate Manipulated by Hydration Levels?*

Kate Schwab, Russell Sands, and Cassandra Garcia

Faculty Sponsor: David Pike, Department of Biology

#24 *Effects of Urban Road on Lichen Growth*

Emmaline Wittwer, Rachel Tong, Shannon Mosmiller, and Katie Tucker

Faculty Sponsor: David Pike, Department of Biology

#25 *Effect of Sunlight on Ilex aquifolium Stomatal Density*

Sydney Davis, Liam Goldman, Katherine Lynn, and Emily Rankin

Faculty Sponsor: David Pike, Department of Biology

Sciences

#26 *Analyzing Protein Kinase C interactions with Rho4 and Bud3 in the filamentous fungus*

Aspergillus nidulans

Brianna Betton, Joanna Hobson, and Elisabet Olsen

Faculty Sponsor: Loretta Jackson-Hayes, Department of Chemistry

Cell division in filamentous fungi involves coalescence and subsequent constriction of a contractile actomyosin ring (CAR), as in other fungi and metazoans. In fungi, constriction of the CAR is followed by deposition of cell wall material resulting in a septum. In the model organism, *Aspergillus nidulans*, many proteins are involved in septation including protein kinase C (PkcA), the formin SepA, the GTPase Rho4, and its guanine nucleotide exchange factor (GEF) called Bud3. In previous work we showed that PkcA both physically and functionally interacts with SepA. The formin SepA belongs to the Diaphanous-related family of formins that contain an N-terminal Rho binding domain that upon binding of the appropriate Rho GTPase results in formin activation. In *A. nidulans* Rho4 is likely the GTPase required for SepA activation. Reports from another group have shown that Rho4 and Bud3 work as a module that is required for septation to occur. The current study focuses on the relationship of the Bud3/Rho4 partnership with PkcA and SepA during polarized growth. Using bimolecular fluorescence complementation (BiFC) and overexpressing PkcA in Bud3- and Rho4-null strains, we examined the relationships between PkcA and Rho4 and PkcA and Bud3. Through BiFC we found that PkcA and Rho4 interact at septation sites. Overexpressing PkcA in a Rho4-null mutant strain increased colony diameter and improved sporulation. However, PkcA overexpression in a Bud3-null mutant had no effect on growth and sporulation. These results suggest that there are physical and functional interactions between PkcA and Rho4 that are important in polarized growth.

#27 *Epitope characterization and design of epitope binding proteins for idiopathic membranous nephropathy: new tools for autoimmune kidney disease*

Liam Goldman and Omar Stocks

Faculty Sponsor: Shana Stoddard, Department of Chemistry

In autoimmune diseases (AD), antibodies incorrectly attack normal bodily cells, which can promote degradation of certain tissue and lead to long-term disease and possibly death. Modern clinical therapies treating autoimmune diseases include the use of immunosuppressive medicine (IM). This treatment diminishes the entire immune system's ability to fight off pathogens. This highlights the need for more specific treatment options for AD that do not weaken the patient's immune system. Idiopathic membranous nephropathy is an organ specific AD currently being treated with IM. Seventy percent of patients produce autoantibodies that target the phospholipase

A2 receptor (PLA2R). The goal of this research is to design PLA2R specific binding proteins that will prevent the PLA2R autoantibodies from binding to the C-Type Lectin Domain Number Seven of the PLA2R antigen. Using Epitopia and EPCES, three possible epitope sites regions were identified and characterized. Binding strength was measured through Rosetta Online Server that Includes Everyone (ROSIE). Presently, mutations to increase the binding proficiency to the predicted epitope regions on the CTLD-7 are being optimized. Furthermore, this research could provide patients with more specific methods of treatment for AD than the current immunosuppressive therapies.

#28 *Analyzing Protein Kinase C domain interactions with the formin SepA.*

Yahya Hameed, Brianna Betton, Lynsey Campbell, William Freyaldenhoven, Elisabet Olsen, Ashmeet Singh, and Pramika Sriram

Faculty Sponsor: Loretta Jackson-Hayes, Department of Chemistry

This research focuses on understanding polarized growth in filamentous fungi. In the model organism *Aspegillus nidulans* and other filamentous fungi, polarized growth is focused at the hyphal tip and septa, and growth at both areas involves deposition of cell wall material. Our previous work uncovered a protein-protein interaction between PkcA and the formin SepA. Both PkcA and SepA localize to hyphal tips and septation sites. Using bimolecular fluorescence complementation, we found SepA and PkcA physically interact at both sub-cellular locations through amino acid residues within the C-terminal half of SepA. Past research has proven two regions of PkcA are responsible for PkcA localizing to hyphal tips and septation sites. The first region is a 10 amino-acid sequence near the carboxyl end of the C2 domain that is required for localization to hyphal tips and septation sites. The second region is between the C2 and C1B domain, and is sufficient for localization to septation sites only. New research presents progress towards determining which PkcA domains are involved in its interaction with SepA by using the previously published PkcA truncations in Gal4-based yeast two hybrid assays. These results shed light on the mechanism underlying SepA's and PkcA's complementary involvement in polarized growth.

#29 *Quantification of viral and host cytokine IL-10 expression in a mouse model of Epstein-Barr virus infection*

Sarah Morris and Gary Lindquester, Department of Biology

Faculty Sponsor: Gary Lindquester, Department of Biology

A hallmark of Epstein-Barr virus (EBV) is its ability to persist in a host for extended periods of time by avoiding immune response and preventing viral clearance. Upon viral infection, the host cell typically releases interferons to promote apoptosis and stimulate lymphocyte populations to combat viral replication. Many persistent viruses like HIV or EBV impair these T-cell responses by stimulating the production of IL-10, a cytokine that inhibits a host's ability to control viral replication. Importantly, EBV encodes a viral homolog of IL-10 during the lytic phase and induces host production of IL-10 during latency. In a 2014 study by Lindquester et al., EBV viral

IL-10 expression was shown to enhance the acute phase of pathogenicity in a murine gammaherpesvirus model but did not affect latent populations of host IL-10. Using this model, the current study seeks to quantify both host and viral IL-10 expression via quantitative PCR in the murine host in order to investigate the mechanism of vIL-10 in EBV's pathogenicity.

#30 *Creating a Knockout Strain of the Fungus Aspergillus Nidulans*

Kinsey McGlasson and Darlene Loprete, Department of Chemistry

Faculty Sponsor: Darlene Loprete, Department of Chemistry

Fungi have beneficial and deleterious effects on the environment, industry and human economy. Fungi grow as long filamentous cells, called hyphae, and contain a cell wall which is essential for the growth and maintenance of the organism. This research involves a novel gene, MtlA, which affects cell wall integrity in the filamentous fungus *Aspergillus nidulans*. Plasmid-borne, extra copies of MtlA can suppress the calC2 mutation in the *A. nidulans* orthologue of protein kinase C (PkcA), which results in hypersensitivity to the chitin-binding agent Calcofluor White (CFW). In filamentous fungi, as in yeasts, hypersensitivity to CFW correlates with defects in cell wall integrity. In order to better understand the relationship between PkcA and MtlA, we have developed a strategy to knockout the MtlA gene, and replace it with the gene for riboflavin biosynthesis (ribA) from *Aspergillus fumigatus* which is used for selection. This will allow transformation of the newly created strain with plasmid copies of PkcA, and determine if PkcA can rescue the altered phenotype. I have PCR amplified a 1kb upstream piece, digested it with EcoRI and BamHI, purified it and digested the plasmid pGem4Z with the same restriction enzymes, and performed a ligation. The next steps are to ligate the other two pieces into pGem4Z.

#31 *DNA Methylation and Health Outcome in an Aging Cohort*

Alexandra Bartlett, Rhodes College; Khyobeni Mozhui, The University of Tennessee Health Science Center, Department of Preventive Medicine & Department of Genetics, Genomics, and Informatics

Faculty Sponsor: Charles Snyder, Department of Anthropology & Sociology

DNA methylation undergoes extensive remodeling over the course of life, and is considered to be a biomarker of human age and potentially predictive of health and lifespan. Here, we track changes in DNA methylation over time and its significance with regards to healthy aging. Using principle component analysis, we found: PC1 is strongly correlated with blood cell type, PC1 captures lymphoid and granulocyte signal, this signal is robust specific to blood cell type, and PC1 is significantly associated with cancer outcome at both visit years 1 and 6. Primary cancer sites include: leukemia, prostate, colon, breast, and stomach. There was no greater age acceleration in the cancer group, and the methylation age for all samples increased over time. While the methylation age appears significantly older than the actual chronological age, our analysis shows that the methylation age is sensitive enough to capture longitudinal age progression over the course of 5 years. Our data demonstrates that we can derive information on

cellular composition and change in cellular composition with age from global patterns in DNA methylation. The methylation pattern may also be predictive of future cancer diagnosis.

#32 *Sequence variability in UL39 and UL53 genes of Herpes simplex virus 1 may contribute to neurovirulence*

Tina Dillas and Gary Lindquenter, Department of Biology

Faculty Sponsor: Gary Lindquenter, Department of Biology

Herpes simplex virus 1 (HSV-1) is a neuroinvasive human pathogen that evades host immune responses and results in life-long infection. Primary infections generally occur around the mouth and lips from viral transmission through oral secretions. Following infection, HSV-1 spreads to the host nervous system and establishes latency. The virus's ability to reactivate infection depends on the site of infection, virus strain, and host immunity. HSV-1 infection normally causes mild symptoms; however, in rare cases the virus enters the central nervous system and, if untreated, can lead to fatal encephalitis. The purpose of this study was to explore genetic variation in HSV-1 and consider how frequently differences that may contribute to central nervous system virulence occur in circulating viral strains. Twenty-two HSV strains were obtained from collaborators at the Centers for Disease Control and Prevention. These strains vary in their neurovirulence as determined previously in mouse studies. Here, we assessed variation in the DNA sequences of two viral genes designated UL39 and UL53 (encoding ribonucleotide reductase and glycoprotein K, respectively) due to their involvement in HSV-1 neurovirulence. Sequences of these genes from the twenty-two viral strains were compared to identify variations that correlate with high or low neurovirulence.

#33 *The Arabidopsis chromatin remodeling ATPase, CHR23, demonstrates a novel parental effect on seed size*

Madeleine Mabante and Jonathan FitzGerald, Department of Biology

Faculty Sponsor: Jonathan FitzGerald, Department of Biology

The genetics of seed size is confounded by the strong parental contributions to seed growth and development. For example, using Columbia (Col) ecotype pollen on C24 ovules produces an atypically large seed whereas the reverse cross produces a normal seed. Although Histone and DNA methylation pathways are both known to contribute to parental biases in seed size, specific realizers of the parental programs are not known. Using DNA methylation-sensitive AFLP, a screen was conducted for cis and trans-regulators of differential DNA methylation between Col and C24. A locus was identified, CHR23, that shares homology with SWI/SNF2-type chromatin remodeling ATPases. CHR23 has been implicated in cell growth and the regulation of gene expression, though most of its function remains uncharacterized. Crossing CHR23 mutants and wild-type Col Arabidopsis revealed larger seeds when CHR23 was the maternal factor, larger seeds were seen. Surprisingly, homozygous CHR23 seeds appeared in all ways normal. Analysis continued by isolating mRNA from crosses and using reverse transcriptase (RT) and PCR to

amplify expression and identify genes. Next, we will verify CHR23 expression and further identify parental contribution to Arabidopsis seed size.

#34 *Characterizing the Genetic Interaction of AtFH5 and ROP2 in Seed Size and Pollen Tube Growth* ■

Walker Laird, Phuong Le, and Jonathan FitzGerald, Department of Biology

Faculty Sponsor: Jonathan FitzGerald, Department of Biology

AtFH5 is an Arabidopsis formin, an actin nucleating activity involved in cytokinesis, polarized growth and the construction of the seed endosperm. AtFH5 is also a maternally expressed gene. Maternal FIS Polycomb group complexes are required to silence paternal copies of AtFH5, and the *fis atfh5* double mutant lacks the enlarged posterior chalazal cyst typical of the Polycomb mutant. These data suggest that AtFH5 is an important target for seed size and polarization. Although C-terminal formin homology domains in plants are highly conserved with animals and fungi, the N-terminal regulator domain diverges extensively and the typical Rho GTPases required for formin localization and activation in other systems are lacking in plants. Through yeast two-hybrid, the small GTPase Rop2 was identified as a putative AtFh5 binding partner. A ROP2 knockout line, *rop2-2*, showed a square seed phenotype indicating a role in seed size. An F2 population is being screened to identify *rop2-2* and *atfh52-2* double mutants to test whether seed morphology and pollen tube guidance results in stronger defects, epistasis or some other effect.

#35 *Manganese acquisition is important for the resistance of Salmonella Typhimurium to nitrostatic stress*

Shehla Yousuf and Elaine Frawley, Department of Biology

Faculty Sponsor: Elaine Frawley, Department of Biology

Nitric oxide (NO) is a radical molecule that is a mediator of the mammalian host immune response to pathogenic bacteria like *Salmonella Typhimurium*. NO. disrupts binding between ligands and metal co-factors such as zinc and iron, disabling enzymes and releasing free zinc and iron into the cell in potentially harmful doses. Zinc and iron efflux transporters are part of the response to NO., and cellular concentrations of these metals drop following NO. exposure. Manganese levels, however, increase dramatically in response NO. Three manganese transport systems are involved in the NO. response, and expression of two increases in response to NO. Manganese levels initially increase after NO. stress and then gradually return to normal levels. Additionally, combination manganese transport mutants show increased sensitivity to NO., suggesting that manganese influx is required for NO. resistance in *S. Typhimurium*. We hypothesize that manganese takes the place of iron or zinc in proteins to facilitate recovery following exposure to NO.

#36 *Relationship Between Long Acting Reversible Contraceptive Use in Adolescent Females and Sexually Transmitted Disease*

Filoteia Popescu, Rhodes College; Karen Derefinko, Department of Preventive Medicine, University of Tennessee Health Science Center

Faculty Sponsor: Charles Snyder, Department of Anthropology & Sociology

Teenage pregnancy remains a national health concern, and there are several health and social risks associated with teenage motherhood, including complications during pregnancy and unsafe abortions. In addition, babies born to adolescent mothers generally have substantially elevated risk of birth complications (preterm birth, low birthweight, death). Although a number of contraception methods exist, long-acting reversible contraceptives (LARCs) are a relatively new class of birth control; they include intrauterine devices (IUDs) and subdermal contraceptive implants and are administered by medical staff. Failure rates of these “user independent” contraceptives are below 1%, offering the best protection rate among all contraceptives. However, concern exists that increasing LARC use among adolescent girls may have unintended consequences of decreasing condom use for the prevention of sexually-transmitted diseases and infections (STD/Is). Despite this concern, no studies have directly explored the relationship between LARC use vs. other forms of contraception and STD/I diagnosis in adolescent females. In this analysis of Medicaid claims from 39,749 girls age 14-19, we found that clinical risk for STD/I acquisition is no higher for LARC than for other forms of contraception. These results support LARC use in adolescent females, as proposed and reaffirmed by the American College of Obstetricians and Gynecologists.

#37 *Synthesis of Mutated Peptides and Computational Evaluation of the FNII Domain of the PLA2R Antigen in Idiopathic Membranous Neph*

Sakura Horiuchi, Zara Parkinson, and Colin Welsh; Shana Stoddard, Kimberly Brien, and Roberto de la Salud Bea, Department of Chemistry

Faculty Sponsor: Roberto de la Salud Bea, Department of Chemistry

Idiopathic Membranous Nephritis (IMN) is a kidney specific autoimmune disorder that eventually can lead to a long term kidney damage or complete failure. The phospholipase A2 receptor (PLA2R) was the first antigen identified in IMN and it contains three domains which, auto-antibodies bind to (epitope regions): the ricin domain, the C-type Lectin Domain-1 and the C-type lectin domain 7. However, some patients have a rare subtype of mutations in the Fibronectin type-2 domain (FNII). It has shown that these domains have single nucleotide polymorphisms, some of which contribute to mutations in their peptide sequences. It is thought that mutations, could illicit an immunological response contributing to initiation of the autoimmune disorder. We also have performed computational evaluation of the FNII domain with and without the mutation and evaluate if these mutations could lead to potential epitope regions. We have also synthesized peptides that mimic the FNII domain mutations and will perform ELISA assays to test if there is a difference in the native peptide and the mutated peptide ability to prevent the auto-antibody binding the FNII domain on PLA2R receptor.

#38 *Synthesis and computational evaluation of vorinostat boron derivatives as potential histone deacetylase inhibitors*

Barry Rich, Emma Goldman, Caylon Martin, and Shana Stoddard, Department of Chemistry

Faculty Sponsor: Kimberly Brien, Department of Chemistry

Histone deacetylase inhibitors (HDACi) are presently being used for the therapeutic intervention for various cancers. The histone deacetylase (HDAC) family is involved in the regulation of gene expression and is comprised of 18 different isozymes. One HDAC receptor that is currently being targeted for therapeutic intervention is HDAC2, which has been shown to be overexpressed in colorectal cancer. Another HDAC receptor HDAC8 is known to be overexpressed in neuroblastoma a pediatric cancer. Panobinostat and vorinostat, two current HDACi approved for clinical use, were compared to a set of four boron containing vorinostat derivatives (BCVD) in both HDAC2 and HDAC8 receptors using Sybyl-X docking analysis. Results showed that one BCVD was able to outcompete vorinostat in HDAC2 while 3 derivatives outcompeted vorinostat in HDAC8. Two derivatives were also able to outcompete panobinostat in HDAC8. The synthesis and computational studies will be detailed herein.

#39 *Nickel Schiff Base Complexes for Light Driven Hydrogen Production*

Meghan Kiker and Alex Graves

Faculty Sponsor: William Eckenhoff, Department of Chemistry

Over the next century, the world's population is expected to increase at a drastic rate; therefore it is essential to consider new and more efficient sources of energy such as the use of artificial photosynthesis to generate hydrogen gas. Hence, the development of more active and robust catalysts is necessary in order to make artificial photosynthesis a viable method of hydrogen generation. Recent studies have shown that cobalt complexes with polypyridyl groups are highly active and thus lead to a lower overpotential and higher turnover rate of hydrogen gas. Using 1,1'-(pyridine-2,6-diyl)bis(2-(pyridin-2-yl)ethyl)ethan-1-imine is a promising ligand to study due to its electronic similarity to previously used ligands for cobalt catalyzed hydrogen production. However, the two pyridine substituents may act as pendant bases, enhancing its activity. Nickel complexes were synthesized with this ligand and were spectroscopically and electrochemically characterized. X-ray diffraction revealed an octahedral geometry for $[\text{Ni}(\text{EtPyPDI})\text{NO}_3]\text{NO}_3$ comprising pentadentate chelation of the EtPyPDI ligand and nitrate coordination. Cyclic voltammetry experiments showed reversible redox waves at -0.92 and -1.77 V vs Fc/Fc+. In the presence of acetic acid, a catalytic wave corresponding to hydrogen formation was observed at -2.26 V vs Fc/Fc+. Hydrogen production was observed under electrocatalytic and light-driven conditions.

#40 *Analysis of nicotine in clay samples by solvent extraction and gas chromatography mass spectrometry*

Nada Lelovic, Nuanqiu Hou, Christine Chuang, and Jessica Ustick; Dhammika Muesse and Jon Russ, Department of Chemistry

Faculty Sponsor: Dhammika Muesse, Department of Chemistry

Detecting nicotine in historic and prehistoric smoking pipes is important in understanding the origins of tobacco use by early humans. Therefore, developing a robust analytical method to detect trace amounts of nicotine in clay samples will be an important addition to the archaeologist's tool box. In this study we attempt to develop a method to optimize the extraction of nicotine from clay. Clay samples infused with 33.8 PPM nicotine were extracted using different combinations of methanol, chloroform, and potassium hydroxide to determine the solvent combination for optimum nicotine extraction. Gas chromatography mass spectrometry (GC-MS) was used to identify and quantify nicotine extracted from clay samples.

#41 *GPU accelerated atomic energy calculations using ECG functions*

Zachary Wall and Mauricio Cafiero, Department of Chemistry

Faculty Sponsor: Mauricio Cafiero, Department of Chemistry

Calculating the wave function and energy levels of atoms and molecules is a fundamental problem in computational chemistry. In the previous work of Boys and Singer electronically correlated Gaussian functions or ECG's which contain explicit electron-electron distances demonstrated increased accuracy and efficiency. Optimizing the variational parameters contained in these ECG basis sets is the largest computational bottleneck. By calculating the analytical energy gradient with respect to these variational parameters this bottleneck is partially alleviated, but the gradient calculation is still computationally expensive. This work uses the graphics processor unit or GPU as opposed to the CPU to perform the bulk of gradient calculations. The GPU contains many more cores than a cpu and allows for faster parallel processing of simple matrix calculations. The goal of this work is to increase the efficiency of these calculations to get more accurate results on larger atomic systems.

#42 *Hydrogen Production Catalyzed by a Cobalt Schiff Base Complex*

Phillips Hutchison, Meghan Kiker, and Cameron Tinker

Faculty Sponsor: William Eckenhoff, Department of Chemistry

As the world's population increases, developing new energy sources, such as artificial photosynthetic hydrogen production, is becoming a priority. Recent studies have shown the effectiveness of cobalt complexes with polypyridine ligands acting as catalysts for light driven hydrogen production. 1,1'-(pyridine-2,6-diyl)bis(2-(2-pyridinyl)ethyl)ethanimine is a promising ligand because of its electronic similarity to ligands previously used for cobalt catalyzed hydrogen production. Ligands were synthesized following procedures in available literature and subsequently complexed to cobalt using a $\text{Co}(\text{BF}_4)_3$ salt. Recent work has focused on further purification of the ligand to eliminate impurities in the complex. Electrochemical

analysis shows redox waves at -0.725V and -2.147V vs Fc/Fc^+ . In the presence of acetic acid, a catalytic wave, indicative of hydrogen formation, was observed at -2.147V vs Fc/Fc^+ . These results suggest that this complex might be suitable in light driven artificial photosynthetic systems.

#43 Experimental and Calculated Solvatochromic Characteristics of $\text{MoCl}_4(\text{diimine})$ Anions ■

Alison Chang and William Eckenhoff, Department of Chemistry

Faculty Sponsor: William Eckenhoff, Department of Chemistry

A solvatochromic compound is a chemical compound that changes its color based on solvent polarity. Various molybdenum anions with the form $[\text{Mo}(\text{N}^{\wedge}\text{N})\text{Cl}_4]$ -and $[\text{Mo}_2(\text{N}^{\wedge}\text{N},\text{N}^{\wedge}\text{N})\text{Cl}_8]$, were found to possess solvatochromic behavior. $[\text{Li}(12\text{-crown-4})][\text{Mo}(\text{bpy})\text{Cl}_4]$ was found to be soluble in solvents ranging from water to acetone with an accompanying color change from yellow to blue. Similar colors were observed for the related $[\text{PPh}_4][\text{Mo}(\text{bpy})\text{Cl}_4]$ in the same solvents. When examined by UV-vis, the absorption of $[\text{Li}(12\text{-crown-4})][\text{Mo}(\text{bpy})\text{Cl}_4]$ shifted $\sim 110\text{nm}$ across the visible region while $[\text{PPh}_4][\text{Mo}(\text{bpy})\text{Cl}_4]$ shifted $\sim 70\text{nm}$. X-ray crystal structures of both of these species show very little difference in the structure of their octahedral Mo anion and good agreement with previously known structures. A bimetallic molybdenum compound, $[\text{Li}(12\text{-crown-4})]_2[\text{Mo}_2(\text{bppz})\text{Cl}_8]$ ($\text{bppz}=2,3\text{-bis}(2\text{-pyridyl})\text{pyrazine}$), was found to display solvatochromism red-shifted in respect to its monometallic counterpart, covering over $\sim 140\text{nm}$ the visible region in the same solvents. However, another bimetallic compound $[\text{Li}(12\text{-crown-4})]_2[\text{Mo}_2(\text{bpm})\text{Cl}_8]$ ($\text{bpm}=2,2\text{-bipyrimidine}$) was more similar to $[\text{Mo}(\text{bpy})\text{Cl}_4]$ -and displayed a similar color range and solvatochromic shift. Molecular calculations are currently underway to better understand this interesting effect.

#44 New therapeutic tools for IMN: Design of antigen specific binding proteins targeting the THSD7A antigen

Mounika Aramandla and Maggie Palopoli

Faculty Sponsor: Shana Stoddard, Department of Chemistry

Autoimmune diseases (AD) result from the attack of healthy cells by the immune system. AD are the second leading cause of chronic illness. Current therapies combatting AD, immunosuppressive medicines, are non-specific and weaken the patient's immune system, decreasing the ability to elicit a full immune response, thus putting them at higher risk of being unable to fight off basic infections. Idiopathic membranous nephropathy is a kidney specific AD affecting 10-12 million people. One subset of patients with IMN produce autoantibodies that target the thrombospondin type-1 domain-containing 7A (THSD7A). In this work, THSD7A antigen specific binding proteins are being designed to prevent the THSD7A autoantibodies from binding the THSD7A antigen. Characterization of the five potential epitope clusters identified (alpha, beta, gamma, delta, and epsilon) was performed. Currently, the monoclonal antibody templates, 5DC9, 5DC0, 5E95, 3RZW, 5DC4, are being used to design potent antigen specific binding proteins for THSD7A. Initial in silico mutagenesis and design of these antigen specific binding

proteins will be discussed. This research could provide patients with more specific treatment routes for AD than the current immunosuppressive therapies.

#45 *Design of Novel Inhibitors for the Aldehyde Dehydrogenases* ■

Caroline Magee and Emma Selner; Larryn Peterson and Mauricio Cafiero, Department of Chemistry

Faculty Sponsor: Mauricio Cafiero, Department of Chemistry

L-DOPA is commonly used as a xenobiotic for patients with conditions such as Parkinson's disease. L-DOPA is transformed into dopamine by DOPA-decarboxylase. Dopamine derived from L-DOPA is deactivated via metabolism by a series of enzymes including Aldehyde dehydrogenases (ALDH). The targeted inhibition of the ALDH enzyme may help to prolong the effectiveness of L-DOPA, resulting in a net increase in pharmacological efficiency. By selectively designing an inhibitor for ALDH, the effectiveness of the L-DOPA can be extended by regulating the metabolism of dopamine derived from L-DOPA. The effectiveness of a series of potential inhibitors has been measured via in silico models in which the strength of interaction between each substrate and the enzymatic active site was analyzed. A crystal-structure of the ALDH enzyme with an inhibitor bound in its active site (PDB ID: 4WP7) was used to create a model of the active site. Novel dopaminergic derivatives were optimized in the active site using M062X/6-31G with implicit solvation and with relaxed amino acid side-chains. Ligands can fit into the active site in a number of ways; this work examines single molecules orientations and double molecule orientations. Interaction energies between the ligands and the protein were calculated using M062X with the 6-311+G* basis set. Some potential inhibitors show promising results such as the MP and CM series. Mutant enzymes were also studied for their affinity for the ligands.

#46 *DFT analysis of water clusters, dopaminergic derivatives, and their desolvation energies* ■

Emily Sanders and Mallory Morris; Larryn Peterson and Mauricio Cafiero, Department of Chemistry

Faculty Sponsor: Mauricio Cafiero, Department of Chemistry

Our current research explores the synthesis, metabolism, and excretion of novel catecholamines which could serve as drugs in the dopaminergic pathway. By studying all of the enzymes involved in the dopaminergic pathway, we can paint a comprehensive picture of how these catecholamines will behave in our bodies which will help us find novel drugs that could treat conditions such as Parkinson's disease. Computational models of dopaminergic analogs were used to examine the substrates' binding in the enzymatic active site. The binding of a ligand to an enzyme not only involves the interaction between the ligand and the enzyme but also the energy lost or gained by desolvation of the ligand. Desolvation of dopaminergic derivatives was examined using a series of hydration shells that increase in size. The desolvation energies were calculated using M062X with the aug-cc-pvdz, cc-pvdz, and cc-pvtz basis sets. Ligands with the carboxylic acid and nitro substituents exhibited the least favorable energies, whereas the nitrile

substituents exhibited the most favorable desolvation energies in each of the explicit water models. The implicit Polarizable Continuum Model was also used together with explicit solvation to calculate desolvation energies of dopaminergic ligands. The use of implicit and explicit models was compared. This information will be combined with prior research done on ligand/enzyme interaction in order to get a more comprehensive understanding of ligand binding in this system.

#47 *Understanding the Molecular Basis of the Interaction between NPM1 and ALS-associated R-rich Dipeptide Repeat Polypeptides.*

Patrick Wilkerson, Rhodes College; Dhammika Muesse, Department of Chemistry, Rhodes College; Diana Mitrea and Richard Kriwacki, St. Jude Children's Research Hospital
Faculty Sponsor: Dhammika Muesse, Department of Chemistry

Expansion of repeats of the hexanucleotide, GGGGCC, in the C9ORF72 gene is the leading cause of amyotrophic lateral sclerosis (ALS) and frontotemporal dementia (FTD). Normally, this hexanucleotide sequence is repeated no more than 23 times while patients with ALS/FTD have more than thirty repeats, with repeats of over a thousand frequently observed. This results in the creation of many dipeptide repeat (DPR) polypeptide from both the sense and antisense reading frames. A total of five DPR polypeptides are produced: glycine-alanine (GA), glycine-arginine (GR), proline-arginine (PR), proline-alanine (PA) and glycine-proline (GP). Particularly, arginine containing DPRs (GR and PR) are toxic to cells. They appear to interact with important RNA-binding proteins with low complexity sequence domains, disrupting their function. One of the important proteins in the DPRs interactome is the nucleolar protein, nucleophosmin (NPM1), that is responsible for liquid-liquid phase separation (LLPS) of proteins and RNA within the nucleolus. Toxic DPRs have been shown to undergo LLPS at 1: 1 stoichiometry with NPM1 in vitro. In this study, we aim to understand the molecular basis of the interaction of R-rich toxic DPRs and NPM1 by studying the LLPS propensity of DPRs with varied repeat sequences with NPM1.

#48 *The Effect of Mutations on the Binding of Ligands in Phenylalanine Hydroxylase*

Rachel Giampapa and Madison Perchik; Laryn Peterson and Mauricio Cafiero, Department of Chemistry

Faculty Sponsor: Mauricio Cafiero, Department of Chemistry

There are many molecules that act on dopamine and dopamine-like binding sites in enzymes and transport proteins. Some effects of these proteins are beneficial while others are detrimental. We are designing inhibitors for this group of proteins. Phenylalanine hydroxylase (PheOH) is a tetrahydrobiopterin-dependent monooxygenase that influences the rate determining step of converting phenylalanine into tyrosine by hydroxylating phenylalanine. Both phenylalanine and tyrosine are important components in the anabolism of dopamine. A deficiency of PheOH can cause hyperphenylalaninemia, which gives rise to phenylketonuria (PKU), a severe disease that can cause mental retardation if one's diet isn't strictly monitored. A suite of dopaminergic

derivatives has been developed as potential inhibitors of the PheOH enzyme. The inhibitory effectiveness of these dopaminergic derivatives has been measured via in silico models in which the strength of interaction between each substrate and the enzymatic active site was analyzed. A crystal-structure of the PheOH active site, with bound thienylalanine, was isolated from the Protein Data Bank (PDB ID: 1KW0). Mutants of the wildtype structure have been created from the crystal structure based on common point mutations. The positions of novel dopaminergic ligands were optimized in the mutant active site using M062X/6-31G with implicit solvation and with flexible amino acid side-chains. Interaction energies between the ligands and the protein were calculated using M062X and MP2 with the 6-311+G* basis set. The effects of mutations on bonding will be discussed.

#49 *Environmental Threats facing Lake Baikal*

Alisa Redding and Peter Hossler, Urban Studies Program

Faculty Sponsor: Peter Hossler, Urban Studies Program

Reaching a depth of 5,580 feet and estimated to be 25 million years old, Lake Baikal, located in Siberia, is regarded as the oldest and deepest lake on earth. Lake Baikal holds 20% of the world's freshwater and is therefore of extreme value to environmental and human life. The lake is home to hundreds of endemic species of animals and plants, most notable of which, is the copepod, *Epischura baicalensis*, that works as a filtration system in the lake's water to keep it clean. However, in recent years, the lake has begun to suffer from the effects of improper waste disposal, urban/industrial development, and deforestation. In 2014, 1,500 metric tons of algae washed up onto the shores of Lake Baikal, indicating a rise in eutrophication and fecal contamination. Using the program, ArcGIS 10.2.2, four different raster projections highlight distinct issues impacting the lake, and where their influence is concentrated.

#50 *Implementing a Goodness of Fit Test for CAR(1) and CARMA(2,1) Lévy Driven Processes in R*

John Snyder and Ibrahim Abdelrazeq, Department of Mathematics & Computer Science

Faculty Sponsor: Ibrahim Abdelrazeq, Department of Mathematics & Computer Science

Continuous Autoregressive Moving Average (CARMA) models are commonly used for financial modeling. However, this model is often misattributed to data that it does not fit. Using a decomposition of a CARMA(2,1) process into a CAR(1) process, we can use the statistical tools in R to determine if data really is Lévy Driven CARMA(2,1). We use statistical theory, goodness of fit tests, and autocorrelation to see if a proposed function is CARMA(2,1). This allows anyone with access to the package to test if their data is a Lévy Driven CARMA(2,1) process.

#51 *The Potentially Cyclic Nature of Groups whose Orders is the Product of Twin Primes*

Warner Raulston and Christopher Seaton, Department of Mathematics & Computer Science

Faculty Sponsor: Christopher Seaton, Department of Mathematics & Computer Science

Fundamental to mathematics and the modern world is the discipline of Group Theory, the study of groups. Groups are a set of elements paired with a binary operation that obeys a set of axioms. A cyclic, or monogenous, group is a special class of group generated by a single one of its elements. An example of this is the integers. The order of a group is the number of elements that it contains. Using Lagrange's Theorem, we can prove that every group of order 35 is cyclic. 35 is the product of twin primes, primes whose difference is 2, in this case they are 5 and 7. The properties used to prove that all groups of order 35 are cyclic might be generalizable and applied to all groups whose orders are the product of twin primes, meaning that all such groups must be cyclic.

#52 *Modeling the Evolution and Diffusion of a Rumor in a Close-Knit Community* ■

Brandon Bates and Erin Bodine, Department of Mathematics & Computer Science

Faculty Sponsor: Erin Bodine, Department of Mathematics & Computer Science

In the age of "fake news," society has become increasingly self-aware in its ability to spread and interpret information from within. Today, news spreads at incredibly high rates due to the accessibility and influence of modern communications. Similar viruses, information spreads by infecting susceptible individuals, and over time, it mutates into a completely different infection. However, unlike viruses, there is no vaccine to keep people immune from information, and in fact, people tend to promote transmission. In an effort to capture this phenomena, we've created an agent-based model that simulates the evolution of a rumor throughout a close-knit community. Our simulation tracks the spread of a rumor as well as which pieces are distorted, restored, and lost. Our goal is to understand how environmental factors and individual tendencies affect rumor transmission, evolution, and overall fidelity.

#53 *Vasopressin receptor expression in *Anolis carolinensis* relative to season (breeding vs. non-breeding) and sex (male vs. female)*

Laura Cardona, Pooja Dave, and Filoteia Popescu

Faculty Sponsor: David Kabelik, Department of Biology

The social behavior neural network contains a variety of signaling neuropeptides, such as vasopressin (VP), and their receptors. Previous studies in rodents and songbirds have demonstrated that there are differences in neural vasopressin receptor (VPR) expression based on sex (male vs. female) and season (breeding vs. non-breeding). VPRs are G protein-coupled receptors consisting of several subtypes. The V1aR and V1bR subtypes are the most well-known mediators of the effects of VP on social behavior. Understanding differences in receptor expression can help us understand behavioral differences across sexes and seasons. Using green anoles (*Anolis carolinensis*), 10 breeding season animals (6 males and 4 females) and 12 non-breeding season animals (6 males and 6 females) were compared for amount of V1aR expression across pertinent brain regions. Using autoradiography, we analyzed the amount of V1aR by overlaying photomicrographs of Nissl-stained brain sections over the autoradiography slides in Photoshop, and then outlined target brain regions. Average pixel brightness was determined as a

measure of V1aR expression for each area. Based on previous research, we predict that breeding males will have generally higher V1aR expression than females and non-breeding males. We also predict no difference in V1aR expression among females between seasons.

#54 Characteristics of patients referred to Headache Clinic at Le Bonheur Children's Hospital
Evan Roark, Rhodes College; Lara Koral, University Le Bonheur Pediatric Specialists;
Tonya Polk, Christy Zarski, and Davonna Ledet, Le Bonheur Children's Hospital; and
Webb Smith, University of Tennessee Health Science Center

Faculty Sponsor: David Kabelik, Department of Biology

Chronic headaches are common ($\geq 30\%$) in children and adolescents. These headaches often limiting attendance and performance in school and decrease overall quality of life. In July 2017, a multidisciplinary Headache Clinic at LeBonheur Children's Hospital was developed to treat children with chronic intractable headaches (CIH) uncontrolled by primary care management. 33 patients (14.2 ± 3.2 yrs; 27 female; 24 Caucasian, 6 African American; body mass index 24.0 ± 6.0 kg/m²; 52% had Medicare/Medicaid) were evaluated by neurology, physical therapy, and exercise physiology between 7/1/2017-12/15/2017. All referred patients had headaches ≥ 3 days/week/ ≥ 3 months and attempted lifestyle modification and controller medication for ≥ 6 weeks. On average, patients tried 6 medications (currently taking 3 medications) to control headaches. Commonly prescribed medications ($\sim 30\%$ each) are gabapentin, amitriptyline, and topiramate. Twenty (60.6%) patients have a family history of headache/migraine. One third of patients report headache symptoms consistent with severe disability while 58.3% and 8.3% report mild and moderate disability, respectively. CIH result in substantial negatively impact on school and activity participation. Children with CIH are difficult to treat effectively due to complexity of causative and contributing factors, and varying medication effectiveness. More research is needed to evaluate the effectiveness of specialty pediatric headache clinics.

#55 A medium throughput compound screen for approved drugs that suppress seizures in Dup15q syndrome ■

Avani Alapati, Rhodes College; Jungsoo Han, Department of Neurology; Tracy Peters, Department of Clinical Pharmacy; Glen Palmer, Department of Pediatrics; and Lawrence Reiter, Department of Anatomy and Neurobiology, UTHSC

Faculty Sponsor: David Kabelik, Department of Biology

Debilitating seizures that often become pharmaco-resistant to common anti-epileptic drugs (AED) are a hallmark of Dup15q syndrome, especially among individuals with isodicentric duplications of 15q11.2-q13.1. A novel fly model of Dup15q recapitulates this seizure phenotype through over-expression of Dube3a in glial cells where UBE3A is bi-allelically expressed.

We conducted a medium throughput screen of 1280 small molecules from the Prestwick Chemical Library. For screening we used the fly bang sensitivity assay (BSA) to determine if any adult flies expressing Dube3a in glial cells (repo>Dube3a) could be rescued by treatment (1 μ M in DMSO). Flies of the genotype repo-GAL4/TM3,Sb were crossed to UAS-Dube3a

homozygous flies and the offspring were raised entirely on food with 1 μ M of drug in DMSO or DMSO alone control food at 25°C. Adult flies were removed after 3 days and newly emerging flies were aged for 4 days prior to the BSA. Flies were subjected to 10s of stress induced seizures and then immediately sorted for seizure vs non-seizure, then scored for genotype in order to identify *repo>Dube3a* animals in both seizure and non-seizure groups. We identified 13 potential candidates that can suppress seizures in *repo>Dube3a* flies.

#56 *Determining the Seizure Outcome in Pediatric Patients With a Vagus Nerve Stimulator (VNS) and Investigating the Re-Organizing o* ■

Nithila Ramesh, Rhodes College; Abbas Babajani-Feremi, Department of Pediatrics, University of Tennessee Health Sciences Center; and Nagar Noorizadeh, Department of Pediatrics, University of Tennessee Health Sciences Center

Faculty Sponsor: Kelly Dougherty, Department of Biology

Within the context of temporal lobe resections, a year of being seizure-free can be highly anticipated in 53-84% of patients with their anteromesial temporal lobe resected, and in 66-100% of those with localized epilepsy (Spencer, S., & Huh, L et al. 2008). However, in those patients with partial or generalized epilepsy, such resections are not always medically recommended due to their invasive nature; additionally, approximately 30% of epilepsy patients still experience seizing even after tailored medical treatment. The goal of this study is to locate a biomarker or determine a set of biological and medical parameters that can determine the seizure frequency of a patient that has undergone VNS placement for generalized or partial epilepsy, and to see if there is any reorganization of the brain network from before to after VNS implementation. Utilizing a combination of functional MRI, high-density EEG, MEG, and neuropsychological evaluations and subsequent data that have been analyzed through the MATLAB data analysis program, patients that have been examined before, during, and after VNS implantation were analyzed for biomarkers such as functional connectivity, topography, waveform frequency, time lapse, sensor channel neighbor correlation, the effects of the powerline on the data quality, the number of bad channels/segments, and the ratio of artifact components from brain components.

#57 *Characterization of Temporal and Longitudinal Development in the Hippocampus*

Andrew DaRosa, Madeline Evans, Elizabeth Gaudio, Steven Mysiewicz, Catie Renna, Lelo Shamambo, Bilal Siddiq, Sri Velrajan, Trevor Van Vliet, and Mogy Yu

Faculty Sponsor: Kelly Dougherty, Department of Biology

Epilepsy is a neurological disorder characterized by recurrent seizures. Researching epilepsy requires animal models, as the brain manipulation required to understand epileptogenic activity is not possible in humans. Extracellular recordings measure network level activation in slice models of epilepsy. A magnesium-free solution is often used in slice physiology to increase excitation, through enhanced glutamate receptor activity. Magnesium blocks the activation of glutamate receptors via binding near the pore region. Magnesium also lowers calcium's ability to initiate presynaptic neurotransmitter release. We aim to elucidate the mechanisms of a dorsal

neuro-protective system, which reduces the excitability of dorsal hippocampal tissue with age. While the mechanisms underlying the magnesium-free model are well established, the effects of this model across the longitudinal axis of the hippocampus and throughout development have not been clearly characterized. We studied the effects of the magnesium-free model through extracellular field recordings of CA1 pyramidal neurons from dorsal and ventral hippocampal slices throughout development, and found young, dorsal hippocampal tissue to be the most excitable. Additionally, our data suggests the effect of no magnesium is minimal in ventral slices. These data support the theory of the dorsal protection system being critical in the reduction of excitability seen with age.

#58 *Effect of long term storage on the ultrasonic backscatter measurements of cancellous bone*

Evan Main, Luke Fairbanks, and Brent Hoffmeister, Department of Physics

Faculty Sponsor: Brent Hoffmeister, Department of Physics

Osteoporosis is a degenerative bone disease that causes normally porous bone tissue, called cancellous bone, to become more porous and weak. The increased porosity manifests itself as a thinning of the branch-like trabeculae, increased spacing between the trabeculae and decreased interconnectivity. Our laboratory is developing ultrasonic techniques that are sensitive to changes in cancellous bone caused by osteoporosis. Most laboratory studies perform ultrasonic measurements on excised specimens of bone. Between studies, the specimens are stored in refrigerated phosphate-buffered saline solution (PBS). The goal of this study was to determine if the ultrasonic properties of the specimens remain stable over an 18 month period of storage. Two sets of measurements were performed approximately 18 months apart. The specimens were stored in refrigerated PBS between measurement trials. The average percent difference between measurement trials for nMBD and nBAR were 3.67% and 3.91%, respectively. Statistical analysis using a paired T-test found no significant difference ($p < 0.05$) between measurement trials for either parameter. Thus, the measured ultrasonic properties of human cancellous bone appear to remain stable in refrigerated phosphate buffered saline solution for at least 18 months. This research is supported by NIH NIAMS R15AR066900.

#59 *Size-based Sorting of Magnetic Microparticles using Patterned Circular Arrays in Variable Magnetic Fields* ■

Thomas Cullom, Noah Sanchez, Robert Raulston, and Gregory Vieira, Department of Physics

Faculty Sponsor: Gregory Vieira, Department of Physics

The controlled locomotion of superparamagnetic microparticles is useful for lab-on-chip biomedical devices and sorting heterogeneous particle populations. We have built and refined a low-cost system capable of applying tunable magnetic forces and moving particles of varying sizes. Controlled locomotion is made possible by patterning micro-sized circular NiFe arrays onto a 1 cm² silicon chip, generating magnetic traps at the circles' peripheries when external fields are present. The direction of particle motion is determined by pre-programmed sequences

of changing magnetic field and input from a joystick, allowing the user to manipulate the particles in real-time. Particles of varying sizes were used, ranging from 2 μm – 4 μm in diameter. For given field sequences, we have found that each particle has a maximum velocity, dependent on its size and selected features of the platform, at which it can travel across the array. At higher velocities, microparticles of differing sizes transverse the circular array at different rates. The particles possess an intrinsic cut-off velocity, dependent on diameter, at which they can no longer transverse the array. This allows the user to selectively manipulate particles of a particular size, potentially allowing for sorting of the microparticles.

#60 *Identifying Inconsistent Use of Class Related Terms*

Madeline Estes and Matthew Weeks, Department of Psychology

Faculty Sponsor: Matthew Weeks, Department of Psychology

It is common place for researchers studying social class to use terms and labels that describe class interchangeably. This study attempts to tease apart these terms and identify how they have been used to inconsistently describe or categorize groups of people in past research. A sample of 100 participants was collected and given an online survey in which they were presented a list of class related labels (such as “poor,” “low status,” “wealthy,” etc.) and were asked to rank them on the MacArthur Ladder scale as both a single rung of best fit and as a range of applicable rungs. With this data, we were able to compare each term’s placement and range on the ladder and thus identify which terms are interchangeable with each other and which ones significantly differ. The implications of this research include recognition of the individualized nature of class-related terms which will lead to researchers being more accurate in their use of terms and in their identification and description of real groups of people.

#61 *Virtual Reality Escape Room*

Henry Kemp, Mackenzie Busby, Ben Wade, and Andrew Craig

Faculty Sponsor: Betsy Sanders, Department of Mathematics & Computer Science

Escape rooms are a growing market in today’s world of entertainment. Starting as online computer games back in the 2000s, they have grown in popularity in recent years into massive real life experiences, including anywhere from one to several hundred participants. As technological advances are made, the market for escape games in virtual reality has also seen an increase, as the number of games available for purchase has increased dramatically over the past couple years alone; however, it is still nowhere near the level of popularity as it has reached in society as a real life experience, partly due to the lack of accessibility of virtual reality systems. For part of our senior seminar, we have produced an escape room game in virtual reality that aims to test users’ senses of presence and spatial awareness. We believe that with the growing market and expanding accessibility to virtual reality machines, our virtual reality escape room game will provide users with an interesting, unique experience and act as a source of competition for other games available for VR machines currently.

Social Sciences

#62 *A Social Judgements Study: Race by Social Class Association*

Sydney Schlinder

Faculty Sponsor: Matthew Weeks, Department of Psychology

Based on previous research, we expect White targets to be associated with higher levels of SES and Black targets with lower levels of SES. The Go/No Go Association Test (GNAT) will allow us to sort the associations and to assess whether Black Targets are associated with Low status words and occupations, whether White targets are associated with high status words or occupations, or whether both associations exist or do not exist. The shifting standards effect is the tendency for subjective judgments of targets to show null effects of stereotypes while objective judgements of the same targets show stereotypical effects. We're looking at the relationship between the strength with which someone holds the association from the GNAT and their tendency to shift standards in a race-SES paradigm. We would predict that those who exhibited the stereotypical association in the GNAT would exhibit a greater shifting of standards. Our findings demonstrate that those individuals with a strong Race-Status association show a greater shifting standards effect than those with a weak Race-Status association and these effects are primarily driven by the White-High Status association.

#63 *The Effects of Participant Race and SES on IAT Scores*

Emily Nilsen

Faculty Sponsor: Matthew Weeks, Department of Psychology

The purpose of this study was to examine the ways in which individuals associate different racial categories with different levels of socioeconomic status. Specifically, we studied how a subject's personal socioeconomic status and race affect their race-status association Implicit Association Test scores. Previous research indicates that subject race and socioeconomic status influence interpersonal judgments of class-related factors. Our project builds upon this understanding of class-race interactions by observing participants' implicit race-status associations in relation to personal demographics. We examined a) the effects of current levels of respondent SES measured by highest level of education and annual income, in addition to self-reported subjective SES, and b) their race categorized into white or black.

#64 *Measuring the Effects of Exposure on Implicit Measures of Race/Status Associations* ■

Emily Pierce

Faculty Sponsor: Matthew Weeks, Department of Psychology

Previous research indicates that contact with African Americans is positively correlated with the strength of negative racial stereotypes. While the threat response theory claims that the more contact Whites have with African American populations is correlated with more racial bias, contact theory asserts that more contact Whites have with African Americans is actually correlated with weaker racial biases. This marks a gap in previous research that our study aims to

fill by looking to see if meaningful interactions with African Americans will affect racial biases. Our research goal is to expand knowledge of this relationship between racial exposure and implicit stereotypical associations. Our study uses a stereotype IAT to measure the strength of associations between specific racial categories and certain status levels, as well as a questionnaire that seeks to assess the level of exposure White respondents have to African Americans. We will examine respondent's a) frequency of social interactions with low status and high status African Americans, b) frequency of social interactions with low status and high status Whites, and c) how these correlate with stereotypic associations between race and status.

#65 *Moderators of the Shifting Standards Effect*

Jessie Robinson

Faculty Sponsor: Matthew Weeks, Department of Psychology

In order to understand potential factors linked to individuals who show greater tendencies to shift standards, different moderators of the effect must be tested. The purpose of this set of studies is to investigate potential moderators that could affect an individual's tendency to shift standards when making judgments of black and white targets' financial and educational attainment levels. Study 1 tested Social Dominance Orientation and respondent race as potential moderators of the tendency to shift. Study 2 tested internal and external motivations to control prejudice and symbolic racism. Study 3 tested participants' self-judged subjective and objective social economic status, current and childhood resources, and their political ideology. In all three studies, explicitly measured constructs showed weak to non-significant affects with the implicit shifting standards judgments.

#66 *Race-Status Stereotype Interventions*

Michala Hayden

Faculty Sponsor: Matthew Weeks, Department of Psychology

The Implicit Association Test (IAT) is typically used to measure unconscious attitudes that are responsible for stereotyping behavior. Recent research with the IAT has indicated that there might be some short-term modifiability of automatic associations. The present study builds on recent work examining different intervention methods aimed at reducing negative automatic associations. Our work focuses on associations between race (black, white) and socioeconomic status (high-status, low-status). We assess the effectiveness of a short-story intervention with counterstereotypical exemplars, as well as a neutral short-story intervention.

#67 *Race-based Shifting Standards and Financial Compensation in the Workplace*

Emily Watkins

Faculty Sponsor: Matthew Weeks, Department of Psychology

The present study examines the relationship between race and financial compensation within the workplace. Specifically, this study uses the Shifting Standards Model (SSM), which says that people are influenced by stereotypes when making judgments, as a framework to describe why

raise amounts for two identical employees might differ based on race. In SSM, the influence of the stereotype is visible on an objective scale but hidden on a subjective scale. Participants are asked to think of themselves as a Human Resource Manager giving an employee a raise. Based on objective information that is given about the employee, who is either White or Black, the participant will be asked to give a raise in an objective, dollar amount. Then, the participant rates how large that raise is on a subjective scale. The SSM predicts that the Black employee will be given a smaller raise, which would then be rated as subjectively equal, or possibly better, than the higher objective raise the White employee is given. Preliminary data analysis indicates results in line with the predicted pattern, where the Black employee receives a smaller objective raise than the comparably described White employee, even as their raises are described as subjectively the same.

#68 *The Effectiveness of Stereotype Intervention on Reducing Implicit Race-Status Associations*
Samir Rassoul

Faculty Sponsor: Matthew Weeks, Department of Psychology

Past research has demonstrated that there is a much higher occurrence of positive race-status association. In this research study, we attempt to reduce this race-status association through a counter-stereotypic exemplar. Furthermore, participants will be randomly assigned into the neutral or counter-stereotype short story groups, where they will be instructed to read through the exemplar and then answer questions in regard to the reading. Participants were all college students at a private, liberal arts college.

#69 *Do Phonologically-Related Intervening Names Influence Spaced Retrieval of Proper Names?*

Rachel Myers and Hannah Porter

Faculty Sponsor: Katherine White, Department of Psychology

Previous research has shown that names are particularly difficult to learn and retrieve, and related names sometimes facilitate and sometimes compete for retrieval with target names. This study investigated how phonologically-related intervening names influence acquisition and long-term memory for face-name pairs in a spaced retrieval paradigm. Participants studied target names (e.g., Max) and practiced cued retrieval of the names at short or long lags. A phonologically-related (e.g., Matt) or unrelated (e.g., Frank) name was presented immediately following the study trial or immediately preceding the retrieval trial for each target. Acquisition of target names was enhanced by phonologically-related names, but only at short lags. In contrast, retrieval of successfully-learned target names at final test was worse when intervening names were phonologically-related than unrelated. These results will be discussed within current accounts of spaced retrieval practice and interactive activation models of word retrieval.

#70 *The Effectiveness of Precues in Proactively Controlling Emotional Interference During Speech Production*

Lisa His

Faculty Sponsor: Katherine White, Department of Psychology

This research investigated proactive control of emotional interference during speech production. Two experiments presented target pictures superimposed with taboo, negative, or neutral distractors. Proactive control was manipulated by presenting precues that signaled whether a taboo, negative, or neutral distractor would appear on the next trial. Experiment 1 included one block of trials with precues and one without. Experiment 2 mixed precued and uncued trials. Consistent with previous research, taboo distractors slowed picture naming relative to negative and neutral distractors in both experiments. Evidence that precues engaged proactive control to reduce interference from taboo distractors was found in Experiment 1. In contrast, mixing precued trials in Experiment 2 reduced the benefit of cues, with equivalent taboo interference on precued vs. uncued trials. These results suggest that proactive control can be engaged to reduce taboo interference during speech production, but is limited when the control demands of the task are already high.

#71 *An Exploration of Older Adults' Emotional Language Use and Speech Disfluencies in Lifespan Narratives* ■

Danielle Evans

Faculty Sponsor: Katherine White, Department of Psychology

Previous research has shown an age-related increase in the use of positive words when recalling emotional autobiographical memories. Other research on age-related disfluencies in speech production found that older adults produce more disfluencies when describing negatively-valenced images compared to neutral images. The present research investigated older adults' emotional language use and disfluencies when recalling life stories in response to prompts from young adult researchers in a conversational context. Older adults ranged from 66 – 92 years of age ($M = 82$), an older sample than is typically found in cognitive aging research. Participants were prompted to tell stories about a variety of events from several time points in their lives, including positive and negative memories from childhood through adulthood, as well as stories that were less central to their personal experiences or that were expected to elicit more neutral content. Narratives were analyzed using Linguistic Inquiry and Word Count, a computerized text analysis that produces counts for a variety of linguistic and emotional categories. As expected, older adults used a greater proportion of positive than negative words when recalling positive memories from across the lifespan. Furthermore, positive words were used equally or more frequently than negative words when describing negative memories, suggesting a positive reframing of negative memories. Additional evidence for the reframing of negative memories was demonstrated by a greater use of words representing aspects of complex cognitive processing (e.g., cause, think) and lower analytical thinking scores, suggesting more “here and now” thinking, for negative compared to positive memories. Evidence for greater disfluencies

and fillers was also found when narratives described negative memories. These findings suggest that the way in which older adults approach their positive and negative memories is reflected in their speech production.

#72 *Healthy Aging Communities: A Model for Healthy Community-Based Aging in Memphis and Beyond* ■

Caroline Boyd-Rogers

Faculty Sponsor: Katherine White, Department of Psychology

The population of older adults in America rapidly growing, with people over age 50 projected to reach 72 million by the year 2030 (Kerz et al., 2012). Older adults increasingly prefer to remain in their communities and their homes as long as possible because it provides greater independence and also allows them to maintain close relationships with family and friends. Although there are a growing number of programs that aim to support older adults' desire to maintain their independence, existing programs are limited because they either do not comprehensively address critical factors that affect older adults' capacity to maintain independence, or do not fully consider how strengthening communities can enhance the aging process.. Following a thorough review of the empirical literature and discussions with interdisciplinary experts, we developed a comprehensive model that emphasizes healthy aging by strengthening both the individual and the community. Our model incorporates four broad factors (Physical Safety, Physical Health, Resources, and Psychological Health) and many sub-factors that all influence the aging process. We propose that this model can be applied to various communities because it addresses both individual and community contributions to healthy aging.

#73 *Vestals at the table: Convivial Involvement in the Late Republic and Early Empire*

Zaid Matthews

Faculty Sponsor: David Sick, Department of Greek & Roman Studies

Vestal priestesses gained complete financial independence following Augustus' trium liberorum in 9 BCE. The impact that this legal reform had on Vestals' lives as well as Roman life remains somewhat of a mystery. The starting point of the present study is the lack of material and literary evidence to support Katherine Dunbabin's claim that Vestals were required to attend public banquets. In order to investigate the contexts in which Vestals's convivial involvement would have been freely chosen, this study draws from literary, epigraphical, and material evidence between 100 B.C.E. and 200 C.E. We attempt to explain why a Vestal may have wanted to provide funding for certain banquet occasions, as well as which dates in the Roman calendar would have provided the best opportunities for Vestals to advance in social standing. Older Vestals also would have had more opportunities to attend as well as sufficient funds to host banquets compared to the younger Vestals. Regardless of time period, only a portion of the banquets that Vestals attended would have included a sacrificial ceremony, and all of the banquets attended would have provided Vestals different opportunities to advance in social ranking among various social groups.

#74 Levitt Shell Audience Development Research ■

Natalie Peterson

Faculty Sponsor: Shalou Yu, Urban Studies Program

The Levitt Shell annually provides over 50 free concerts at an outdoor bandshell in the heart of Memphis, Tennessee. In partnership with the Memphis Public Libraries, The Levitt Shell provides the “5 Fridays of Free Jazz” concert series, bringing in over 500 attendees each event. The model of free concerts has been used both at the Levitt Shell and Memphis Public Library, though demographics demonstrate that 5 Fridays of Free Jazz has a drastically different audience than the Free Concert Series Levitt Shell in terms of race and ethnicity. This paper examines the question of what factors that motivate people to attend free concerts at these two public venues. Echoing the Levitt Shell annual survey, this research compares the geographies, motivations, marketing methods, and experience of the attendees of the 5 Fridays of Free Jazz and Levitt Shell free concert series. The research team used random sample surveys and informal interviews at each concert; gaining zip codes and demographic data. The Levitt Shell and the Library will be able to see where there are communication and programming gaps. Overall, this project enables further discussion of public spaces in Memphis and how cultural events are accessed and enjoyed.

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